DOI: https://doi.org/10.46811/apjnh/9.2.2

Comprehensive review on tamra bhasma

Shivam Tyagi[1], Praveen Kumar Ashok[2*], Jhuma Samanta[2],Amandeep Singh[3],Abhishek Bhardwaj[4]

[1]Student, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India
[2]Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India
[3]Principal and Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India
[4]Assistant Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India

**Correspondence*
Dr. Praveen Kumar Ashok
Professor, School of Pharmaceutical Sciences, Jigyasa University, Dehradun, Uttarakhand,India, India.

Abstract
Tamra Bhasma, also known as copper ash, is a traditional Ayurvedic herbo-metallic formulation made by repeatedly calcining (Marana) and systematically purifying (Shodhana) copper to produce a fine, stable, and bioassimilable copper oxide-based ash. It has been used historically for respiratory, metabolic, and hepatic conditions, as documented in books like Rasaratna Samuccaya. Ayurvedic qualities like Lekhana, Deepana, and hepatoprotective effects make it helpful in situations where Pitta and Kapha are aggravated. When properly prepared, conversion into non-metallic oxides or sulphides is confirmed by contemporary analytical studies (XRD, SEM, EDAX), guaranteeing safety. Its authenticity is further confirmed by conventional quality tests like Rekhapurnatva, Nischandratva, and Apunarbhava. Clinical observations point to improvements in chronic cough, Prameha-like conditions, and liver dysfunction. Efficacy and safety are guaranteed by appropriate standardisation and supervised administration. Beyond its traditional medicinal uses, Tamra Bhasma holds a unique place in the Rasashastra tradition because it is a prime example of how precise, multi-stage processing can turn a potentially hazardous metal into a pharmaceutically stable product. According to traditional Ayurvedic texts, copper only loses its metallic sheen, becomes finely particulate, and displays qualities that are compatible with human physiology after undergoing complete Shodhana and repeated Marana. In an effort to characterise this transformation, current research frequently reports structural alterations consistent with copper oxides or mixed oxide phases, indicating that the final product behaves differently from raw metal from a therapeutic perspective, Tamra Bhasma is traditionally described as balancing deranged Kapha and Pitta, supporting Agni, and aiding in the clearance of metabolic by-products (Āma). These findings have sparked renewed scholarly interest in the interface between ancient metallurgical practices and modern material science. It is usually only taken into consideration by modern practitioners within more comprehensive therapeutic frameworks that include individualised assessment, herbal support, and dietary regulation. Furthermore, since preparation errors can seriously compromise safety, responsible use necessitates close adherence to dosage recommendations, authenticity testing, and supervision by qualified Ayurvedic doctors. As a result, Tamra Bhasma continues to be an area of ongoing interdisciplinary evaluation as well as a topic of historical significanceIntroduction Tamra Bhasma, also known as "copper ash," is a traditional Ayurvedic herbo-metallic formulation made from elemental copper that has been purified and repeatedly calcined (marana).

Keywords: Tamra Bhasma, Efficacy, Pharmaceutical stable product, Therapeutic effects, Copper

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided the original work is properly credited.

Introduction

In order to make Tamra Bhasma, a traditional Ayurvedic formulation, purified copper, or Tamra, is processed through specific pharmaceutical processes to produce a fine, bio-assimilable ash. [1] It has a significant role in Rasa Shastra, the area of Ayurveda that deals with metals and minerals. Tamra Bhasma has long been valued for its capacity to treat hepatic, metabolic, and respiratory disorders. Shodhana

(purification), Marana (calcination), and multiple incineration cycles with herbal media are the steps in the preparation process that transform raw copper into a stable, safe, and medicinal substance.[6] Tamra Bhasma is referred to in Ayurvedic texts as tridosha-shamaka, which means it helps balance Vata, Pitta, and Kapha. It is especially helpful in conditions that result from aggravated Pitta and Kapha. Its properties include being Lekhana (scraping),Deepana (appetite stimulating), and Hepatoprotective. It is frequently recommended for conditions like anemia, indigestion, obesity, and some chronic respiratory conditions because of its capacity to improve metabolism and support liver function.[5] Furthermore, its revitalizing properties support general vitality.Tamra Bhasma quality evaluation is essential, and traditional tests—like fineness, lack of metallic sheen, and Rekhapurnata (ability to enter the fingers' lines)—ensure its correct preparation and security. Tamra Bhasma is regarded as safe and effective when properly prepared and administered under the supervision of qualified Ayurvedic practitioners.[1]

HISTORY

The traditional Ayurvedic Rasa-Shastra tradition is the foundation of Tamra Bhasma. Medieval alchemical treatises such as Rasaratna Samuccaya, which was written between the 13th and 16th centuries CE, describe how to prepare and use it.[11] Rasvaidya (alchemist-physicians) developed advanced purification (shodhana), incineration (marana), and revitalization (amritikarana) techniques to make metallic copper therapeutically safe as the use of copperbased medicines grew over centuries. In the past, Tamra Bhasma was used to treat a wide range of illnesses, including respiratory disorders, anemia, liver and spleen enlargement, and bleeding disorders.[9] Studies conducted in the middle of the 20th century (e.g., Department of Postgraduate Teaching & Research in Ayurveda, Jamnagar) showed that it was clinically effective in treating hepatosplenomegaly, cough (Kasa), and asthma (Shvasa), frequently at dosages as low as 65–125 mg in combination with herbal adjuvants.[7] As contemporary research has advanced, researchers have gone back to traditional techniques to standardize the production of Tamra Bhasma, creating repeatable procedures that include exact temperature control and repeated putas (heating cycles).[2] The final product usually contains copper in oxidized or sulfide forms, according to analytical studies (XRD, SEM, EDAX). Tamra Bhasma has remained important in Ayurvedic medicine over time, connecting traditional alchemical knowledge with contemporary pharmaceutical validation.[10]

AYURVEDIC PROPERTIES

- **Rasa (Taste):** Ayurvedic descriptions of Tamra Bhasma state that its Rasa consists of the following: Amal (sour), Madhura (sweet), Tikta (bitter), and Kasaya (astringent).
- **Guna (qualities):** is defined as Tikshna (sharp), Ruksha (dry), and Laghu (light).
- **Virya (potency):** Ushna (hot), which denotes that it has a warming effect.
- **Vipaka:** Katu (pungent) (post-digestive effect).
- **Dosha-Karma (Effect on Doshas):** It is believed to normalize Pitta and detoxify Kapha.[15]

TYPES OF BHASMA

1. **Metals (Dhatu):** Prepared from purified metals (Śuddha Dhātu) through **Shodhana → Marana → Amrutikarana**.eg-: Loha Bhasma (iron), Tamra Bhasma (copper), Rajata Bhasma (silver), and Swarana Bhasma (gold).
2. **Upadhatu, or sub-metals:** Derived from secondary metals that are not true metals but are related to them. eg- Sasyaka (Blue Vitriol, or copper sulphate), Suvarna Makshika (gold pyrite), and Raupya Makshika (silver pyrite/iron pyrite), etc.
3. **Minerals and gems (Ratna & Uparatna):** Prepared from gems and minerals transformed into ash form. eg-: Manikya (Ruby), Mukta (Pearl), Vaikranta (Tourmaline), Suryakanta (Sun stone), etc.
4. **Natural minerals (Khanija):** These are prepared from non-metallic minerals commonly used in Ayurvedic formulations. eg:-Conch shell, gypsum, etc.
5. **Herbal ashes (Vanaspati):** These are prepared from Vanaspati. eg:- Kampillaka, specific plant exudates or resins, etc.[20]

PROPERTIES OF BHASMA

Broad therapeutic range:-

- Their particles, which range in size from micro to nano, enable them to penetrate deeper tissues.
- Because of their broad applicability, classical texts refer to them as "sarvaroga hara."

Biocompatibility and behaviour of nanomedicine:-

- Bhasma that has been properly prepared is compatible with bodily tissues and physiochemically stable.
- Better absorption and cellular interaction are made possible by particles that are frequently in the nanoscale.

- Toxicity is eliminated and safety is improved by the Shodhana (purification) and Marana (incineration) processes.

Stable shelf life:-

- Bhasmas don't deteriorate for decades or more.
- Unlike herbal remedies, they do not deteriorate.
- Many of them are referred to as "ajarāmarā" (non-decaying) in classical texts.

Rapid Absorption (Shighravyapti):-

- Because of their large surface area and incredibly fine particle size (sūkṣma pāta):
- Bhasmas swiftly enter the bloodstream.
- Compared to many herbal preparations, they begin to produce therapeutic effects more quickly.

Uniformity/Unama:-

- The buoyancy and fineness of Bhasma are referred to as unama.
- When properly prepared Bhasma is submerged in water, it floats, a sign of ultra-fine, light particles.
- This test demonstrates appropriate burning and transformation into a stable nanostructured form.[24]

USES OF BHASMA

1. Immunity Boost/Immune Modulation
2. Haematinic Use and Treatment of Anaemia
3. Conditions of the Respiratory System
4. Metabolic and Digestive Issues
5. Disorders of the Liver and Spleen
6. Support for Cancer and Tumours[21]

Tamra bhasma(copper ash)-baidyanath product

Definition

Tamra Bhasma is a traditional Ayurvedic remedy made from copper (Tamra) is called Tamra bhasma. It undergoes a number of purification procedures, such as calcination, to produce a non-toxic, bioavailable form.[27]

Different Types of Methods of Preparation

1. Gandhaka-Maran Method
2. Kajjali (Mercury + Sulphur) Method
3. Kupipakwa Method
4. Putapaka Method
5. Amritikarana (Potentiation)
6. Swedana (Specific Shodhana)[27]

Details about Gandhaka-Maran method of preparation:-

The Gandhaka (Sulphur) is used:-

The marana (incineration) medium in this process is purified sulphur (Gandhaka). the bhasma that results from using Gandhaka frequently forms a copper-sulfide compound (e.g:-covellite, CuS). But because sulphur is "ushna" (hot) and tikshna (sharp), it can produce "strong" bhasma,[27]

Purification:-

Copper (Tamra) needs to be purified (or "shodhana") in the traditional manner before the Gandhaka marana: samanya shodhana (general purification) + vishesha shodhana. Tamra is heated repeatedly until red-hot and then quenched in media such as buttermilk (takra), cow urine (gomutra), sour gruel (kanji), sesame oil (tila taila), and Kulattha kwatha.

Preparation of Gandhaka for Marana:-

Before being used, gandhaka (sulphur) is purified (shodhana). For instance, sulphur is purified in classical Rasashastra to eliminate any harmful or undesired "doshas" (impurities). The marana cycles then employ purified Gandhaka.[32]

The Marana Process (Incineration/Calcination):-

Together, the purified copper and purified Gandhaka are triturated, frequently using a "wet medium" (bhavana).

Following trituration, the mixture is shaped into pellets or boluses and placed in a closed crucible, resembling an earthen pot.

In a contemporary (standardised) process, 19 Putas (incinerations) using Gandhaka as the medium produced Tamra Bhasma in a muffle furnace.

The puta cycle temperatures are regulated; temperatures between 500 and 600 °C.[31]

Copper Sulphide Formation:-

The primary end product of the Gandhaka method, according to analytical (XRD) studies, is copper (II) sulphide (covellite).[35]

Another study found that the final bhasma contained a significant amount of sulphur and approximately 62% copper.

(Potentiation) Amritikarana:-

Amritikarana, or post-marana stabilisation and purification, is carried out following marana. amritikarana in the Gandhaka method usually entails triturating the bhasma with either lemon juice or purified Gandhaka + panchamrita (a mixture of milk, ghee, sugar, honey, etc.).

Bhasma Pariksha and Quality Control:-

Following preparation, the bhasma is examined to verify correct formation using traditional Bhasma-Pariksha tests (such as Rekhapurnatva, Varitaratva, and Apunarbhava).[31]

Marana process:-In the Ayurvedic calcination process known as Marana, purified metals or minerals are repeatedly heated to a high temperature (Puta) and treated with herbal triturations (Bhavana) to produce Bhasma, a fine, non-toxic, biologically absorbable ash.

Following steps involve in calcination process:-

1. Preparation of Tamra:-When copper becomes brittle, it is either turned into thin foils or, if possible, powdered. blended with particular herbal ingredients.

2. Initial Puta: Combining with Herbal Media:-Herbal extracts like these are used to triturate Tamra (Bhavana).

Nimbu Swarasa,or other such as decoctions from Chaturjataka.

A soft paste is created from the mixture.

3. Puta (Calcination)

Puta-agni is applied to the sealed Samputa.The term "gajaputa" refers to a large pile of approximately 1000 cow dung cakes. The material is gathered once it has cooled.

Copper turns into: Greyish or blackish following the initial Puta.

4. The finished product

The ultimate Tamra Bhasma ought to be:Light, reddish, and fine.[29]

Analytical finding of Tamra Bhasma:-

Clinical Evidence of Tamra Bhasma (Overview)

1. Clinical Evidence in Liver Disorders (Yakrut Vikara)

Studies Report the Following Outcomes:

- Improvement in symptoms of hepatomegaly**,** fatty liver**,** loss of appetite, and indigestion**.**
- Reduction in liver enzymes (AST/ALT) in mild-to-moderate cases when Tamra Bhasma used as part of Arogya Vardhini–based regimens.
- Better bile secretion and digestion due to its Pittavardhaka and Deepana–Pachana effects.[29]

2. Clinical Evidence in Prameha (Conditions Similar to Type-2 Diabetes)

Studies Report the Following Outcomes:

- Blood sugar during fasting
- Sugar after meals
- Polyuria, exhaustion, and excessive thirst are examples of symptoms
- Combining Guduchi, Nisha, or Shilajatu yields better results.[27]

3.Clinical Evidence on Respiratory Conditions(Kasa–Shwasa)

Results reported:

- Reduction in the frequency of persistent coughing
- Enhanced expectoration
- Decrease in dyspnoea in mild to moderate situations[27]

Safety tests:-

Ayurvedic tests:-

Complete Shodhana-Eliminates chemical and physical contaminants

Amritikarana-Remove remain toxicity.[20]

Traditional safety tests:

Nischandratva (no shine of metal)

Micro-fine Rekhapurnatva

Varitaratva, or floating on water

Apunarbhava (not able to change back to metal)

Aampariksha (no bodily symptoms of toxicity).[28]

Evaluation parameters for Tamra bhasma:-

I. Rekhapūrṇatva: This test measures fineness by rubbing a pinch between fingers, which should fill the skin's lines and cracks and show very small particle size.

II. Apunarbhava Pariksha: Irretrievability: the bhasma shouldn't return to its original metal following a specific chemical or heat treatment.[35]

III. Amla (Amala) Pariksha: This Tamra Bhasma-specific method entails treating with an acidic medium (such as amla juice) to make sure there is no unconverted metal or free copper present.[10]

IV. Loss on Drying: Determines the amount of moisture left behind, which aids in determining how stable and dry the bhasma is.

V. Particle Size Distribution (PSD): A contemporary test that uses laser diffraction, for example, to demonstrate how fine the particles.[13]

Table:-1 Evaluation Parameters for Tamra Bhasma and their observations

Parameter	Observation
Color	Brick-red
Consistency	Very fine, smooth powder
Particle Size	nano to submicron range (50–500 nm)
pH	Slightly alkaline or neutral
Loss on drying	Very low

Observations

The clinical effectiveness of Tamra Bhasma in cases of Shvasa and Amlapitta was assessed in the first research conducted in 1964. In addition to honey and other herbal powders like Guduchi (Tinosporia cordifolia Willd.) and Amalaki (Phyllanthus embilica Linn.), the medication was given at a dose of 65–125 mg.[39] The preliminary study yielded encouraging results. In 1965,

a different study assessed the clinical effectiveness of Tamra Bhasma and Somnathi Tamra Bhasma (STB) on Yakrit Pliha Vriddhi (hepato-spleenomegaly), Kasa (cough), and Shvasa (bronchial asthma). According to reports, STB contains 24% Cu and traces of arsenic (80 ppm), whereas Tamra Bhasma contains 37% Cu. [39,23] Five clinically diagnosed cases of Shvasa received a dose of 65 mg of Tamra Bhasma and Talisadi churna for 30 days in a row. Six clinically diagnosed cases of Shvasa received 125 mg of STB, Pippali churna, and Madhu for 30 days in a row. It was discovered that both medications significantly reduced the signs and symptoms of Shvasa. With encouraging outcomes, both medications were also given in the cases of Kaphaja Kasa and Yakrit Pliha Vriddhi.[27] According to reports, STB outperformed Tamra Bhasma in terms of clinical efficacy. The clinical effectiveness of Tamra Parpati's pharmaceutical study on Yakrit Pliha Vridhhi and Grahani Roga was assessed in 1968.For 30 days, patients with Yakrit Pliha Vridhhi and Grahani received 250 mg of Tamra Parpati twice daily along with Madhu and other appropriate adjuvants like Takra. Tamra Parpati was found to reduce the size of the enlarged liver and spleen by up to 65%. Patients at Grahani also reported feeling better. In 1988, the role of marana media in Tamra Bhasma preparation was examined.[37] Three distinct media (Parada, Gandhaka, and Kantakari) were used to prepare Bhasma. According to reports, the most straightforward and accurate medium for ensuring safe media in the preparation of Tamra Bhasma is Gandhaka (sulphur). The researcher mentioned that it was challenging to prepare Tamra Bhasma in front of Parada media.[29] In Tamaka Shvasa, Tamra Bhasma demonstrated noteworthy outcomes. In 1991, research was conducted to revalidate the anti-asthmatic properties of Mallasindura, Gandhaka Marita Tamra Bhasma, and Dhattura Mulatvak Swarasa Bhavita Kajjali. Comparative study of these three Yogas was done on 56 known patients of Tamaka Shvasa for 21 days.[21]

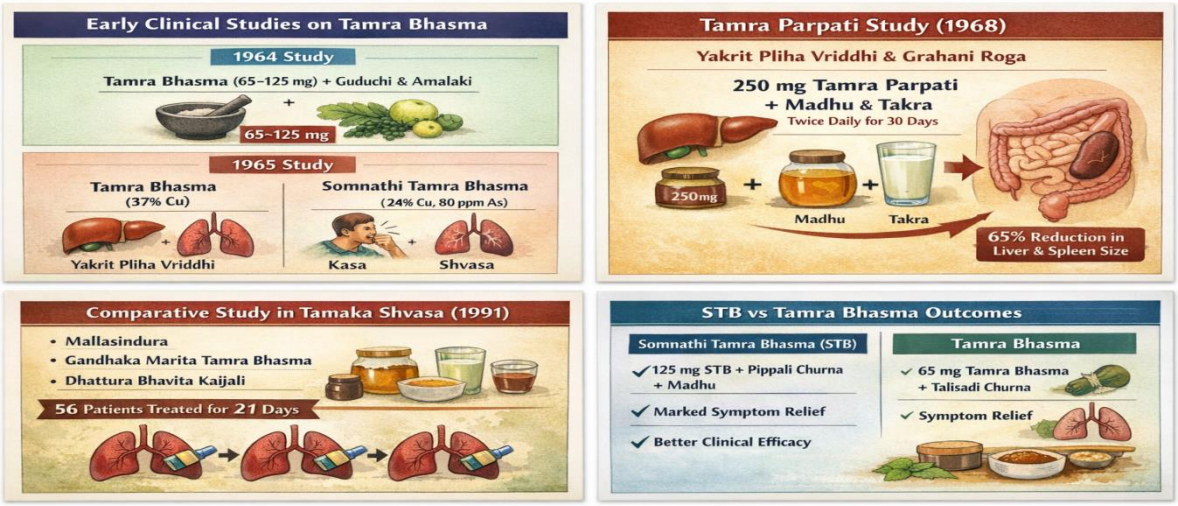

Fig 1:Observations related to Preparation and evaluation of Tamra Bhasma

Conclusion

To transform metallic copper into a safer and more biologically active form, Tamra Bhasma, a traditional Ayurvedic copper-ash formulation, goes through a rigorous processing process that includes shodhana, marana, and amritikarana.[40] Its primary chemical form is copper(II) sulphide (CuS), with approximately 56–62% copper and approximately 22–36% sulphur, according to scientific analysis using methods like X-ray diffraction (XRD), ICP AES, SEM, and PSD.[39] Additionally, trace elements like lead and arsenic are present in trace amounts. Bioavailability is enhanced by conversion to fine, micron or sub-micron particles, and its quality is ensured by traditional tests such as Rekhapūrṇatva and Varītaratva. Tamra Bhasma is regarded as safe and effective for a variety of therapeutic applications when used appropriately and under professional supervision.[40]Tamra Bhasma's description as a modified, non-metallic copper derivative demonstrates the complexity of traditional Ayurvedic metallurgy and its endeavour to make heavy metals suitable for use in medicine. According to recent analytical research examining its

physicochemical profile, copper's crystalline phases are altered by repeated processing steps, such as odhana, Māraṇa, and sometimes Amŭtīkaraṇa, which help form stable compounds like copper sulphide. These structural alterations and a notable decrease in particle size are frequently mentioned as characteristics that set Bhasma apart from raw metal and explain its unique behaviour in biological settings.[27,21] However, the existence of trace elements emphasises how crucial careful planning and quality assurance are comparing conventional definitions of efficacy with experimentally observed characteristics, like antioxidant activity, catalytic potential, or interactions with biomolecules, is becoming more and more popular in modern research. Even though these studies are still in their early stages, they shed light on the ways that modern scientific frameworks and historical pharmaceutics interact. Crucially, traditional practitioners have long stressed that Tamra Bhasma and similar formulations should only be used in the more comprehensive context of personalised evaluation, suitable dosage, and close supervision. The responsible discourse surrounding herbo-metallic preparations is still shaped by this integrative perspective, which acknowledges both traditional insights and contemporary analytical scrutiny.[34,22]

References

1. Vagbhatacharya, Rasaratnasamucchaya, 28/1, Siddhiprada Hindi Commentary by Prof. Siddhi Nandan Mishra. 1st ed. Varanasi: Chaukhambha Orientalia; 2011. p. 633.
2. Saper RB, Kales SN, Paquin J, Burns MJ, Eisenberg DM, Davis RB, et al. Heavy metal content of ayurvedic herbal medicine products. JAMA. 2004;292:2868–73.
3. Vagbhatacharya Rasaratnasamucchaya 5/48, Vidnyanbodhini Hindi Commentary by Prof. Dattatraya Ananta Kulkarni. Reprint Edition. New Delhi: Meherchand Lachamandas Publications; 2007. p. 100.
4. Ibidem. Rasaratnasamucchaya, 5/47. :100.
5. Madhava Upadhyaya. Reprint Edition. Varanasi: Chaukhambha Bharti Acadamy; 2007. Ayurveda Prakasha, 3/116, Artha vabodhini Sanskrit Commentary, Suspashtavabodhini Hindi Commentory by Vd. Gulraj Sharma Mishra; p. 368.
6. Ibidem. Ayureda Prakasha, 3/146. :373.
7. Yadavji Trikamji Acharya. Rasamrutam, 3/41-44, Bhashatikasamnvitam by Vd. Devnath Singh Gautam. Varanasi: Chaukhambha Bharti Acadamy; 2008. p. 33.
8. Dinanath T, Bhatt OK, Tryambakgiri D. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1964. Tamra Vidnyaniyam.
9. Laxmipati Sastri, Yogaratnakara . Reprint Edition. Varanasi: Chaukhambha Prakashana; 2010. Vidyotini Hindi Commentary; p. 131.
10. Acharya Somdeva. Rasendrachudamani, 14/66-68, Siddhiprada Hindi Commentary by Vd. Siddhinandan Mishra. Reprint Edition. Varanasi: Chaukhambha Orientalia; 2009. p. 246.
11. Trivedi SC, Bhatt OK. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1964-1965. Tamra Bhasma and Somnathi Tamra Bhasma (a comparative study).
12. Yadavji Trikamji Acharya. Rasamrutam, 9/71-75, Bhashatikasamnvitam by Vd. Devnath Singh Gautam. Varanasi: Chaukhambha Bharti Acadamy; 2008. p. 124.
13. Patel MB, Bhatt OK. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1968. Tamra Parpati-Ek Adhyayana.
14. Pt. Hajarilal Sukula, Pt. Ramsankar Sukula, Sukula Mudranalaya, Patliputra, editors. Rasendra Sampradaya, 2/78. 1955:286.
15. Wadodkar DS, Sharma HS, Pillai KU. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1988. Comparative study of media in the preparation of Tamra Bhasma with special reference to Tamaka Shvasa.
16. Acharya Sadanada Sharma, Rasa Tarangini. 11th ed Reprint. New Delhi: Motilal Banarsidas; 2009. Translated by Shri Kashinatha Shastri; p. 416.
17. Valdoria RN, Sharma HS, Pillai KU. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1991. A comparative study of three “claimed” Shvasahara yogas.
18. Pandit Hariprapannaji. Rasayogasagara, 2/2390-2392. Reprint Edition. Varanasi: Chaukhamba Krishnadas Academy; 2010. p. 157.
19. Joshi BK, Sharma HS. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 1991. Experiments to identify five metallic Bhasmas with special reference to their media.
20. Solanki T, Prajapati PK, Patgiri BJ, Ravishankar B, De S. PG Dissertation Submitted to Gujarat Ayurved University; 2004. Pharmaceutical standardization of Somnathi Tamra Bhasma and its Grahi effect on Grahani Roga.
21. Acharya Sadanada Sharma. Rasa Tarangini, 17th Taranga/19-22, Translated by Shri Kashinatha Shastri. 11th ed Reprint 2009. New Delhi: Motilala Banarsidas; 2009. p. 413.
22. Nayak SV, Prajapati PK, Patgiri BJ, Ravishankar B, De S. Jamnagar: PG Dissertation Submitted to

Gujarat Ayurved University; 2005. Comparative pharmaceutico-pharmaco-toxicity study of Tamra Bhasma and Somnathi Tamra Bhasma.
23. Reddy S, Chaudhari AK, Prajapati PK, Subrata De, Ravishankar B. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 2006. Comparative pharmaceutico pharmacoclinical study of Tamra Bhasma (prepared by applying different Rasa Bhasmas) w.s.r. to its effect on Sthaulya.
24. Nayak SV, Prajapati PK, Ravishankar B. Ph.D. Thesis. Jamnagar: Submitted to Gujarat Ayurved University; 2009. Pharmaceutical standardization of Tamra Bhasma and to evaluate its anti-hyperlipidemic and cardioprotective activity in experimental models.
25. Vagbhatacharya, Rasaratnasamucchaya, 5/53. Reprint Edition 2007. New Delhi: Meherchand Lachamandas Publications; 2007. Vidnyanbodhini Hindi Commentary by Prof. Dattatraya Ananta Kulkarni; p. 101.
26. Jagtap CY, Prajapati PK, Patgiri B, Shukla VJ, Ravishankar B. Jamnagar: PG Dissertation Submitted to Gujarat Ayurved University; 2011. Role of Shodhana in preparation of Tamra Bhasma with respect to its anti-hyperlipidemic activity.
27. Angadi Ravindra, Rasa Tarangini, 17/1-2, Chaukhambha Surbharati Prakashan, Varanasi. First edition 2015. Page No. 272.
28. Mishra Gulraj Sharma. Ayurved Prakash, 3/110, Chaukhambha Bharati Academy Varanasi reprinted 2016. Page No. 366.
29. Trivedi SC, Bhatt OK. Tamra Bhasma and Somnathi Tamra Bhasma (a comparative study). PG Dissertation Submitted to Gujarat Ayurved University, Jamnagar; 1964-1965.
30. Nidhi Chaudhary, Dr. Deepak Nanda, Dr. Esha Vatsa, Mithilesh Kesari, Harshita Chandra, Simran Singh Rathore "The Promise of Usefulness of the Evergreen Shrub *Cassia auriculata*" Journal of Advanced Zoology, 2023; 44 (4): 1249-1261.
31. Ms Pooja Yadav, Dr. Esha Vatsa, Dr Arti Rauthan, "Enhancing Menstrual Awareness among Adolescent Girls: Evaluating the Influence of School Initiatives" Journal of Chemical Health Risks, 2024; 14(2): 3141-314 9.
32. Pandit Hariprapannaji, Rasayogasagara, 2/2390-2392, Reprint Edition. Chaukhamba Krishnadas Academy, Varanasi, 2010; 157.
33. Pandey, B.L.1983. A study of the effect of Tamra bhasma on experimental Gastric ulcers and secretions, Ind. J. Exp. Biol. 21: 258- 264.
34. Tripathi, Y.B., Singh, V.P., Sharma, G.M.K., Sinha, R.K., Singh, D.2003. X-rays diffraction and microscopic analysis of tamra bhasma: An Ayurvedic metallic preparation. Indian Journal of Traditional Knowledge. 2: 107-117.

Source of Support: Nil
Conflict of Interest: Nil