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Review Article

A COMPREHENSIVE REVIEW ON *LAUHA BHASMA*

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ABSTRACT

Rasashastra, a specialized branch of Ayurveda, describes systematic pharmaceutical processes such as *Shodhana* and *Marana* to convert metals into safe, bioassimilable therapeutic agents. *Lauha Bhasma* (incinerated iron) is extensively used in the management of *Paṇḍuroga* (iron deficiency anemia), a major global health concern. **Materials and Methods:** Ayurvedic texts including *Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, Rasa Ratna Samuccaya, Rasendra Sara Sangraha, Ayurveda Prakasha,* and *Rasa Tarangini*. Modern scientific literature was retrieved from databases such as PubMed and Google Scholar. Classical pharmaceutical procedures of *Loha Shodhana* and *Marana* were critically analyzed alongside modern physicochemical characterization techniques such as XRD, XPS, SEM, TXRF, and GIXRF. **Results:** Historical analysis revealed a progressive evolution of *Loha* from a utilitarian metal in the Vedic and Puranic periods to a well-defined therapeutic agent during the *Samhita* and *Rasashastra* periods. Classical texts describe multiple types of *Loha* with *Kaanta Loha* (magnetite) being therapeutically superior. Pharmaceutical processing transformed raw iron into *Lauha Bhasma* with *Jamuna* and *Rakta varna* characteristics. The final *Bhasma* showed high acid- and water-insoluble ash values and absence of toxic metals. Toxicity studies demonstrated no significant acute or chronic toxicity. **Discussion:** Traditional *Rasashastra* procedures effectively modify the physicochemical nature of iron, improving its safety, stability, and therapeutic efficacy. The presence of magnetite nanoparticles explains the enhanced bioavailability, sustained absorption, and *Rasayana* effects described in classical texts. The minimal toxicity and effective hematinic action observed validate the classical claims regarding *Lauha Bhasma* in iron deficiency anaemia.

INTRODUCTION

Ayurveda, one of the oldest medical systems, includes *Rasashastra* as a specialized branch that deals with the purification and therapeutic transformation of metals, minerals, and other potent substances through processes like *Shodhana, Marana, Jarana,* and *Murchana*. These methods render toxic materials safe and bioassimilable. Misunderstanding of these rigorous procedures has led to modern scepticism regarding metal-based medicines. *Rasaushadhis*, particularly *Bhasmas*, are valued for their rapid action, low dosage, stability, and patient acceptability.

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Among them, *Lauha Bhasma* holds special importance in the management of *Panduroga* (iron deficiency anemia), a widespread global health problem. The text emphasizes the need for standardization, safety evaluation, toxicity studies, and well-designed clinical trials to scientifically validate the efficacy of *Lauha Bhasma* in iron deficiency anemia.[1]

MATERIALS AND METHODS

A detailed review of information was done using both modern medical research and classical Ayurvedic texts. Ancient texts such as *Charaka Samhita, Sushruta Samhita, Vagbhata Samhita, Rasa Ratna Samuccaya, Rasendra Sara Sangraha,* Ayurveda *Prakasha,* and *Rasa Tarangini,* along with writings of renowned Ayurvedic scholars, were studied. In addition, data was collected from reliable modern sources like PubMed and Google Scholar for analysis.

RESULT AND DISCUSSION

History

S.No.	Period	Classical References	Description of *Loha* (Iron)
1.	Vedic Period	*Yajurveda*	*Loha* described as a strong and valuable metal
2.		*Rigveda* [2]	Term *Ayas* used for iron, mainly for weapons and chariots
3.		*Atharvaveda*	Iron mentioned as *Sharira ghaṭaka*, indicating its role in blood formation
4.	Smriti Period	*Manusmriti, Yajñavalkya Smriti* [3]	*Ayas* listed among six important metals; used for idols
5.	Purana Period	*Purana texts*	Loha mainly used for weapons, tools, and idols; minimal medicinal use
6.	Samhita Period	*Charaka Samhita* [4]	*Panchaloha* described under *Parthiva Dravyas*; includes *Krishna Loha*; *Loha Rasayana* and *Ayaskriti* mentioned in *Chikitsa Sthana*
7.		*Sushruta Samhita* [5]	*Kantaloha* (magnetite) described in *Upa Yantra Varga*; therapeutic use in *Maha Kushtha Chikitsa;* types like *Ayaskriti, Aushadhi Ayaskriti*, and *Mahaushadhi* explained
8.		*Ashtanga Sangraha* [6]	Differentiates *Krishna Ayas* and *Tikshna Loha*; magnetite included among precious stones; *Kantaloha* used in foreign body extraction
9.		*Ashtanga Hridaya* [7]	Loha Bhasma declared *Agryam* for *Pandu* (anemia); *Loha* included under *Tikta Skandha*
10.	*Rasashastra* Period	*Rasa Shastra texts*	Detailed methods of *Shodhana, Marana*, and therapeutic indications

From the Vedic to Purana periods, *Loha* was mainly recognized as a valuable metal used for weapons, tools, and idols, with early indications of its role in blood formation. During the *Samhita* and *Rasashastra* periods, *Loha* evolved into an important therapeutic agent, with detailed descriptions of *Loha Rasayana, Loha Bhasma,* and pharmaceutical procedures for treating *Pandu* (anemia)[8].

Types of *Loha*

S.No.	Type of *Loha* [9,10,11]	Sub type[12]	Characteristic Features
1.	*Munda Loha*	*Mridu*	Shows low melting point with a smooth, shiny surface
2.		*Kuntha*	Expansion occurs with difficulty under hammering
3.		*Kadara*	Easily breakable with a black-colored fractured surface
4.	*Teekshna Loha*	*Kharaloha*	Shows roughness and brittleness along with a mercury -like sheen
5.		*Saaraloha*	Shows lateral fracture with fine line-like patterns
6.		*Hrunnalaloha*	Very hard in nature with a blackish-white coloration
7.		*Taaravattaloha*	Glossy in texture with a sky-blue appearance
8.		*Vaajiraloha*	Blue and smooth in appearance, does not rust, with delicate fracture lines
9.		*Kaalaloha*	Characterized by bluish-black color, thick slippery texture, and extreme hardness
10.	*Kaanta Loha*	*Bhraamaka*	Exhibits movement because of its magnetic nature
11.		*Chumbaka*	Attracts surrounding iron objects
12.		*Karshaka*	Strongly draws or pulls iron toward itself
13.		*Draavaka*	Can fuse or melt other iron without external heat
14.		*Romaka*	Releases hair-like filaments when fractured.

Classical Properties

- *Rasa - Tikta, Kashaya*
- *Guna- Guru, Rooksha, Lekhana* and *Sara*
- *Virya- Sheeta*
- *Vipaka- Madhura*
- *Karma- Niruttha Lohabhasma* is regarded as *Amruta* (nectar) and a *Rasayana* (immunity enhancer). It acts as *Vrushya* (aphrodisiac), *Balya* (strengthener),

Netrya (eye tonic), *Varnya* (improves complexion), *Medhya* (enhances intellect), *Deepana* (carminative), *Lekhana* (scraping effect), and balances *Vata* and *Kapha-Pitta doshas*.[13,14]

Pharmaceutical Process *Loha*

Samanya Loha Shodhana

Grahya Loha [15,16]
↓
Nirvapa (heating and quenching)
↓
in 7 times each liquid media
1. Tila Taila 2. Takra 3. Gomutra
4. Aranal 5.Kulattha kwatha
↓
Sudha Loha obtained

Grahya Loha[16]
↓
Nirvapa (heating and quenching)
↓
in 7 times *Kadalimoolajala*.
↓
Sudha Loha Obtained

Vishesha Loha Shodhana ***[17,18,19]***

Take *Loha* after *Samanya Shodhana*[17]
↓
Nirvapa (heating and quenching)
↓
in 7 times *Triphalakashaya*
↓
Sudha Loha obtained

Take *Loha* after *Samanya Shodhana*[18]
↓
Nirvapa (heating and quenching)
↓
In *Dugdha, Ghruta, Taila, Gomutra*
↓
Sudha Loha Obtained

Loha Marana

Śuddha Loha Curna[19]
↓
Bhavana (trituration) with any one *Drava (Triphala Kaṣaya, Raktapunarnava Patra Svarasa, Girikarṇika Svarasa, Changeri Svarasa, Jala-vetasa Svarasa, Śalila)*
↓
Preparation of *Chakrika* (pellet formation)
↓
Drying of *Chakrikas*
↓
Sealing in *Sharava-Samputa*
↓
Subjected to *Puta* (heating cycle)
↓
Repetition of *Puta* Process (30 *Putas*)
↓
Jamuna Varna Loha Bhasma
↓
Jalatara (Floats on Water)

Bhanupakita & Sthalipakita Loha Churna[20]
↓
Addition of *Shuddha Hingula* (equal quantity)
↓
Bhavana with *Ghrtakumari Svarasa* (Trituration to Homogeneous Mass)
↓
Drying under *Bhanu* (Sunlight)
↓
Chakrika Nirmana
↓
Sharava-Samputa Bandhana
↓
Subjected to *Gaja Puta*
↓
Svanga Shita (Self-cooling)
↓
Loha Churna Obtained
↓
Addition of 1/20th Part *Shuddha Hingula*
↓
Bhavana with *Triphala Kashaya, Bhrngaraja Svarasa*
↓
Chakrika Preparation
↓
Sharava-Samputa Bandhana
↓
Gaja Puta
↓
Repeated Processing with1/20th Part *Hingula*
↓
Total 40 Gaja *Putas*
↓
Rakta Varna Loha Bhasma obtain

Physicochemical Analysis

During the purification and preparation of *Loha Bhasma*, physical and chemical analyses were conducted at different stages. The raw steel chips initially contained 96.82% iron. After *Samanya* and *Vishesha Shodhana*, iron content decreased only slightly by 0.2%, showing minimal chemical change. Following *Bhanupaka* and *Sthalipaka*, iron content reduced by about 2%, remaining in the Fe form. After *Puta Paka*, the final *Loha Bhasma* contained 89.48% iron, with 98.24% acid-insoluble and 98.44% water-insoluble ash, indicating the absence of other metals. The presence of iron mainly in ferrous oxide form makes it highly bioavailable. The fine particle size achieved through the *Bhasma* process enhances absorption, confirmed by NPST showing a single extended blue spot, signifying uniform fineness[21].

In this study, medicinal-grade *Loha Bhasma* was prepared from purified iron turnings according to classical Ayurvedic procedures and analyzed using modern scientific techniques such as XRD, XPS, TXRF, GIXRF, and SEM to explore its structure and composition. The results confirmed that during the traditional processing steps like *Shodhana*, *Bhanupaka*, and *Putapaka*, metallic iron is transformed into magnetite (Fe_3O_4) containing both Fe^{2+} and Fe^{3+} ions in an approximate 40:60 ratio, indicating the coexistence of FeO and Fe_2O_3 phases. The material exhibited nanostructured particles of around 100nm in size with ferromagnetic behavior, while minor traces of zinc were observed as impurities, likely from herbal or animal-derived ingredients used in preparation. These findings demonstrate that *Loha Bhasma* is a biocompatible and stable nanomaterial, scientifically validating the Ayurvedic calcination process that converts raw iron into a safe, therapeutic form. Its physicochemical characteristics also suggest promising potential for use in iron deficiency treatment, targeted drug delivery, and magnetic hyperthermia-based cancer therapy[22].

Safety & Toxicity

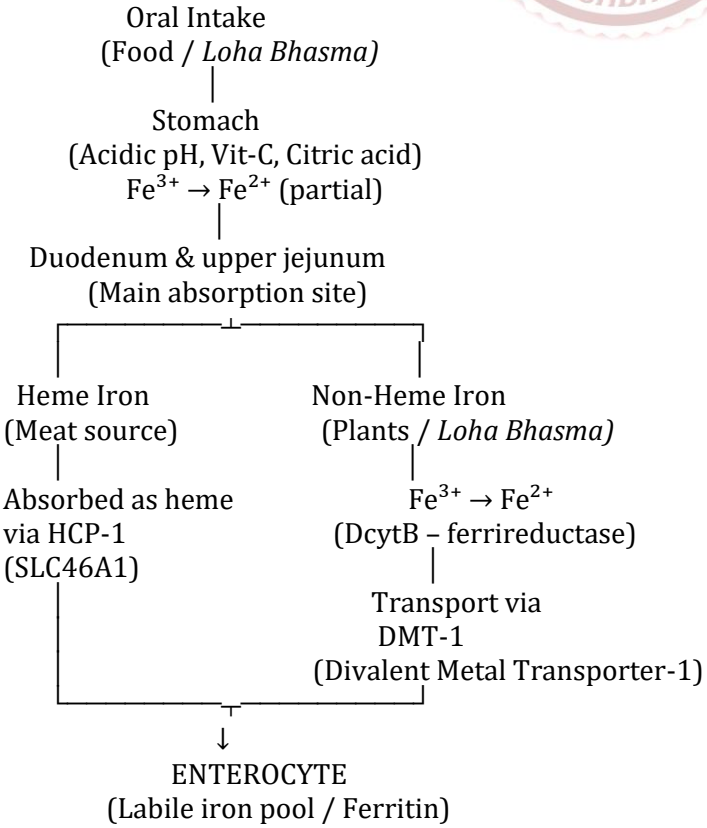
Lauha Bhasma has more ferrous ions than ferric ions and should be regarded as a mixture of iron (22.7%) as the primary element and sulfur, manganese, and zinc as trace elements. *Mandura Bhasma* ought to be recognized as has iron (41.3%) as the main element and manganese and zinc as minor components, with more ferric ions than ferrous ions.

Since neither the acute nor the chronic toxicity studies revealed any substantial toxicity, both *Bhasmas* can be considered safe drugs with a wide range of safety.

Mandura Bhasma has a stronger hematimic effect than *Lauha Bhasma* in test animals. Both *Bhasmas* should be regarded as effective haematinic[23].

Pharmecokinetics of iron

A – Absorption



ENHANCERS
- Vitamin C
- Citric acid
- Amino acids
- Low gastric pH
- *Triphala Bhavana*
- Lemon juice

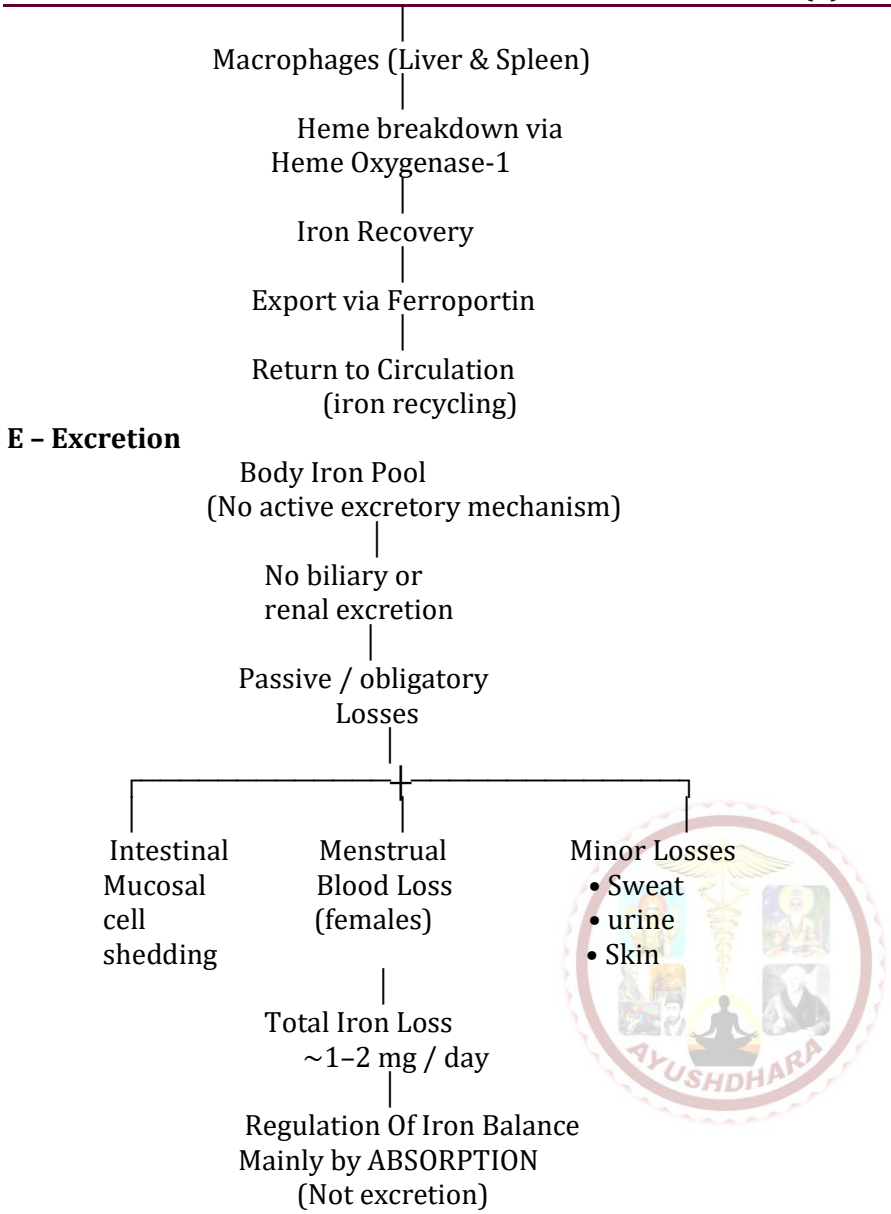
INHIBITORS
- Phytates
- Tannins (Tea)
- Calcium
- Oxalates
- Antacids

D – Distribution

Enterocyte (Absorbed Fe^{2+})
↓
Ferroportin (Export to bloodstream)
↓
Fe^{2+} in Plasma
↓
Oxidation to Fe^{3+} (Hephaestin / Ceruloplasmin)
↓
Fe^{3+} + Transferrin (Plasma transport protein)
↓
Systemic Distribution
↓
Bone marrow (Hb synthesis) | liver (Ferritin / Hemosiderin) | muscles (Myoglobin formation)
↓
Other Tissues (Enzymatic & mitochondrial functions)

M – Metabolism

Circulating Iron (Fe^{3+}–Transferrin)
↓
Cellular Uptake (Target tissues)
↓
Redox Cycling $Fe^{3+} \rightleftharpoons Fe^{2+}$ (Oxidation–Reduction cycle)
↓
Functional Utilization
↓
Heme (Hemoglobin, Myoglobin) | Iron–Sulfur CLUSTERS (Mitochondria) | Enzymes & CYTOCHROMES
↓
Aged RBCs (120 days)



Iron taken orally is absorbed mainly in the duodenum as Fe^{2+}, helped by acidic pH and vitamin C, and reduced by inhibitors like phytates and calcium. The absorbed iron is carried by transferrin for hemoglobin formation, recycled from old RBCs, and body iron balance is controlled by absorption, not excretion.[24]

CONCLUSION

Lauha Bhasma represents a scientifically sound and clinically effective iron formulation developed through classical *Rasashastra* principles. The systematic processes of *Shodhana* and *Marana* transform raw iron into a biocompatible, nanostructured magnetite form with enhanced bioavailability and minimal toxicity. Modern analytical techniques confirm that *Lauha Bhasma* predominantly consists of Fe_3O_4 nanoparticles with favorable pharmacokinetic and safety profiles. Its long-standing use in *Paṇḍuroga* is thus supported by both traditional wisdom and contemporary scientific evidence. Further well-designed clinical trials and standardization protocols are recommended to integrate Lauha Bhasma more effectively into evidence-based management of iron deficiency anemia.

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