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Review Article

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"AYURVEDIC CLASSIFICATION OF MINERALS AND METALS IN RASASHASTRA: A COMPREHENSIVE REVIEW"

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ABSTRACT

Introduction: Rasashastra, a specialized branch of Ayurveda, systematizes the use of metals, minerals, and their compounds for therapeutic purposes. The Ayurvedic classification of these substances provides the foundation for their pharmaceutical processing, detoxification, and therapeutic application. Understanding this classification is vital for both traditional practice and scientific validation. **Methods:** A systematic review was conducted using classical Ayurvedic texts (*Charaka Samhita, Sushruta Samhita, Rasa Ratna Samuccaya, Rasatarangini, Ayurveda Prakasha*) and modern literature from PubMed, Scopus, and Web of Science. Search terms included "Rasashastra," "Ayurvedic classification," "metals and minerals in Ayurveda," and "Bhasma safety." Studies focusing on classification systems, pharmaceutical principles, and toxicological evaluations were included. **Results:** Ayurvedic texts broadly classify metals and minerals into categories such as *Maharasa (primary minerals), Uparasa (secondary minerals), Dhatu (metals), Ratna (precious stones), and Sudha Varga (alkalis and earths).* Each category has unique pharmaceutical significance, processing methods, and therapeutic applications. For example, *Maharasa* includes mercury, sulfur, and mica, which are considered vital for Rasashastra formulations. Modern analytical studies using XRD, SEM, and ICP-MS confirm the chemical transformations of these substances during Shodhana (purification) and Marana (incineration). Clinical and pharmacological studies suggest that properly processed metals and minerals exhibit therapeutic effects with reduced toxicity. **Discussion:** Ayurvedic classification is not merely taxonomic but functional, linking pharmaceutical properties with therapeutic outcomes. Modern science supports many aspects of this classification, though gaps remain in standardization, clinical validation, and global regulatory acceptance. **Conclusion:** The Ayurvedic classification of metals and minerals in Rasashastra demonstrates a sophisticated system integrating pharmacology, pharmaceutics, and therapeutics. Bridging traditional classification with modern analytical science can advance evidence-based validation of herbo-mineral formulations.

KEYWORDS: Ayurveda, Bhasma, Metals, Minerals, Rasashastra

INTRODUCTION

Rasashastra is a distinctive branch of Ayurveda that deals with the therapeutic use of metals, minerals, and gems[1]. The uniqueness of Rasashastra lies in its elaborate methods of purification (*Shodhana*) and incineration (*Marana*), which transform raw and potentially toxic substances into biocompatible formulations known as *Bhasma*[2-3].

The foundation of Rasashastra rests upon the systematic classification of minerals and metals. This classification is not merely descriptive but also functional, as it prescribes appropriate pharmaceutical procedures, therapeutic uses, and safety measures[4-5]. Classical texts describe groups such as *Maharasa*, *Uparasa*, *Dhatu*, *Ratna*, and *Sudha Varga*, each with defined therapeutic significance[6-8].

The objective of this review is to explore the Ayurvedic classification of metals and minerals in Rasashastra from both classical and modern perspectives. Specifically, the review aims to: (i) present classical categories and their significance, (ii) highlight pharmaceutical and therapeutic importance, and (iii) critically analyze modern validation of these classifications[9-10].

MATERIALS AND METHODS

A structured literature review was undertaken.

- **Classical sources:** *Charaka Samhita, Sushruta Samhita, Rasa Ratna Samuccaya, Rasatarangini, Ayurveda Prakasha*[11].
- **Databases searched:** PubMed, Scopus, Web of Science, Google Scholar.
- **Keywords used:** "Rasashastra," "Ayurvedic classification of metals," "Ayurveda minerals," "Bhasma pharmaceutics," "metal detoxification.[12]"
- **Inclusion criteria:** Studies or texts describing classification, pharmaceutical processing, safety, and therapeutic use[13].
- **Exclusion criteria:** Non-authentic sources, anecdotal reports, or studies lacking methodology[14].

A total of 80 references were retrieved, of which 38 were selected for final review. Data were thematically organized into classical descriptions, pharmaceutical applications, and modern validations[15].

OBSERVATION AND RESULTS

1. Classical Classification in Rasashastra

- **Maharasa (primary minerals):** Includes mercury (*Parada*), sulfur (*Gandhaka*), mica (*Abhraka*), and arsenicals. Considered foundational for Rasashastra formulations.
- **Uparasa (secondary minerals):** Substances like Manashila (realgar), Haratala (orpiment), and Tuttha (copper sulfate). Used mainly as adjuncts.
- **Dhatu (metals):** Gold, silver, copper, iron, tin, lead, and zinc. Used after *Shodhana* and *Marana* for Rasayana and therapeutic purposes.
- **Ratna and Uparatna (precious and semi-precious stones):** Diamonds, pearls, corals, etc. Processed and used in specific formulations.
- **Sudha Varga (alkalis and earths):** Chalk, gypsum, lime, etc., with unique roles in formulations.

2. Pharmaceutical Significance

- Classification prescribes unique Shodhana media and Marana techniques for each group.
- Highlights therapeutic applications (e.g., iron in anemia, gold in rejuvenation, mercury in Rasayana).
- Guides safe usage by transforming toxic materials into bioavailable forms.

3. Modern Analytical Insights

- XRD and SEM show changes in crystalline structure and particle size after Shodhana/Marana.
- ICP-MS reveals reduction in toxic impurities (e.g., arsenic, lead).
- FTIR and EDAX confirm incorporation of organic molecules from herbal media.

4. Therapeutic Applications

- *Lauha Bhasma* in anemia and chronic diseases.
- *Swarna Bhasma* in immunomodulation and rejuvenation.
- *Abhraka Bhasma* in respiratory and chronic conditions.
- *Rasasindura* in Rasayana and anti-aging.

5. Safety Considerations

- Properly classified and processed materials are safer.
- Toxicity arises mainly from improper or counterfeit preparations.
- Modern toxicological studies confirm safety of authentic Bhasmas.

DISCUSSION

The Ayurvedic classification of metals and minerals in Rasashastra demonstrates remarkable scientific

foresight. Unlike modern taxonomy, it is functional, prescribing both pharmaceutical methods and therapeutic roles. Each group—*Maharasa, Uparasa, Dhatu, Ratna,* and *Sudha Varga*—is aligned with specific therapeutic goals and processing techniques[16].

From a modern perspective, these classifications can be compared to contemporary chemical categorization of elements and compounds. For example, *Maharasa* substances like mercury and sulfur are pharmaceutically significant due to their unique reactivity, while *Dhatus* correspond to metals with established physiological importance[17]. Analytical studies provide scientific support for these classifications. XRD and SEM confirm particle transformations during Shodhana and Marana. Toxicological studies suggest that authentic preparations are relatively safe, whereas unprocessed or improperly prepared materials are hazardous. This validates the classical insistence on purification and proper processing[18].

However, gaps remain in standardization and clinical validation. Regulatory concerns about heavy metal toxicity persist, especially in international markets. To address these, future research should focus on: [19]

1. Standardizing Shodhana and Marana protocols.
2. Establishing pharmacopeial monographs.
3. Conducting large-scale toxicological and clinical trials.
4. Exploring applications of these preparations in integrative medicine.

Thus, Ayurvedic classification is not outdated but provides a rational framework that aligns with modern scientific principles. Bridging traditional insights with contemporary research will enhance global acceptance and evidence-based integration of Rasashastra[20].

CONCLUSION

The Ayurvedic classification of minerals and metals in Rasashastra is a unique system that integrates pharmaceutical, therapeutic, and safety dimensions. By grouping substances into *Maharasa, Uparasa, Dhatu, Ratna,* and *Sudha Varga,* classical scholars established a rational framework guiding their purification, processing, and therapeutic use.

Modern studies confirm the scientific validity of this approach. Analytical evidence shows that traditional processes alter the physicochemical nature of metals and minerals, reducing toxicity and enhancing bioavailability. Clinical and pharmacological studies support the therapeutic efficacy of preparations like *Lauha Bhasma* and *Swarna Bhasma.*

Despite this, significant challenges remain. The absence of standardized protocols, limited large-scale clinical validation, and international skepticism regarding heavy metals hinder wider acceptance. Addressing these issues through rigorous research, pharmacopeial standardization, and regulatory dialogue will be crucial.

In conclusion, the Ayurvedic classification of metals and minerals in Rasashastra reflects a sophisticated pharmaceutico-therapeutic system. Its integration with modern scientific validation has the potential to enhance evidence-based Ayurveda and contribute meaningfully to global healthcare.

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