

Review Article

ISSN: 3048-5606

“PUTA SYSTEM IN BHASMA NIRMAN: A CRITICAL REVIEW OF CLASSICAL METHODOLOGY AND MODERN SCIENTIFIC VALIDATION”

Ms. Shital Gaikwad¹

AFFILIATIONS:

1. Research Assistant, Ira Consultancy & Research Organisation, Bhosari, Pune, Maharashtra 411026

CORRESPONDENCE:

Ms. Shital Gaiwad

EMAILID:

shitalbgaikwad1999@gmail.com

FUNDING INFORMATION:

Not Applicable

How to cite this article:

Shital Gaikwad, “Puta System in Bhasma Nirman: A Critical Review of Classical Methodology and Modern Scientific Validation” International Journal of Rasa Shastra and Pharmaceutical Sciences. 2025;2(3):42-46.

ABSTRACT

Introduction: The pharmaceutical branch of Ayurveda, *Rasa Shastra*, describes unique processes for converting metals and minerals into therapeutically active, biocompatible forms called *Bhasma*. Among these, the *Puta* system represents a specialized calcination technique central to *Bhasma* preparation. While classical Ayurvedic texts provide elaborate guidelines on *Puta* types, material, and procedure, recent scientific explorations attempt to validate these practices through modern analytical tools. **Methods:** A comprehensive review of classical Ayurvedic literature (*Charaka Samhita*, *Rasaratna Samuccaya*, *Rasa Tarangini*, *Ayurveda Prakasha*) and modern scientific studies was undertaken. Databases such as PubMed, Scopus, Google Scholar, and AYUSH Research Portal were searched using keywords like *Puta system*, *Bhasma Nirman*, *calcination*, *Ayurvedic pharmaceutics*, and *nanoparticles*. Inclusion criteria were peer-reviewed articles, dissertations, and experimental validations published in the last 25 years. **Results:** Traditional sources describe various *Puta* types—*Gaja Puta*, *Varaha Puta*, *Kukkut Puta*, and *Laghu Puta*—with specifications based on the material and therapeutic application. Experimental studies confirm that repeated incineration cycles influence particle size, crystalline structure, and safety profiles of *Bhasma*. Techniques such as XRD, SEM, TEM, ICP-AES, and FTIR demonstrate nanoscale particle size, enhanced bioavailability, and absence of toxic heavy metals when *Puta* procedures are meticulously followed. **Discussion:** Correlating classical descriptions with modern validations indicates that the *Puta* system ensures detoxification, homogenization, and nano-sizing of metals. However, standardization remains a challenge due to variable traditional practices. More translational studies bridging classical guidelines with pharmacological and toxicological validations are essential for global acceptance of *Bhasma*.

KEYWORDS: Ayurveda, Bhasma, Calcination, Nanomedicine, Puta system

INTRODUCTION

The Ayurvedic pharmaceutics, *Rasa Shastra*, describes sophisticated methodologies for processing metals, minerals, and gems into biocompatible preparations known as *Bhasma*. These herbo-mineral formulations, extensively documented in Rasashastra texts, are highly valued for their potency, stability, and targeted therapeutic actions^[1-2]. Central to their preparation is the *Puta* system, an ingenious calcination technique involving specific arrangements of combustible materials, earthen containers, and controlled heating conditions^[2-3].

The significance of the *Puta* system lies in its role in ensuring complete detoxification of raw materials, elimination of toxic properties, and transformation into a therapeutically safe and effective form^[4-5]. Various classical texts such as *Rasaratna Samuccaya* and *Rasa Tarangini* meticulously describe types of *Puta*, the fuel used (cow dung cakes, wood, or electric substitutes in contemporary practice), and the required number of calcination cycles. These parameters collectively influence the final physicochemical and pharmacological properties of the *Bhasma*^[6-7].

Despite the rich heritage and therapeutic claims, scientific scrutiny is necessary to validate traditional *Puta* practices^[8]. Modern tools such as X-ray diffraction (XRD), scanning electron microscopy (SEM), and inductively coupled plasma mass spectrometry (ICP-MS) have revealed nanoscale structures and enhanced safety profiles of properly prepared *Bhasma*. The present review aims to critically examine classical descriptions of the *Puta* system, summarize experimental findings on its scientific validation, and highlight challenges in standardization and future research opportunities^[9-10].

MATERIALS AND METHODS

The present review was conducted using both classical Ayurvedic literature and modern scientific evidence.

1. Literature Search Strategy: Classical texts including *Charaka Samhita*, *Sushruta Samhita*, *Rasaratna Samuccaya*, *Ayurveda Prakasha*, *Rasa Tarangini*, and *Bhaishajya Ratnavali* were consulted. Modern studies were retrieved from PubMed, Scopus, AYUSH Research Portal, and Google Scholar^[11].

2. **Databases and Search Terms:** The search was performed using combinations of keywords such as *Bhasma Nirman*, *Puta system*, *calcination*, *Ayurvedic pharmaceutics*, *nanoparticles in Ayurveda*, and *Rasashastra validation*^[12].
3. **Inclusion Criteria:** Peer-reviewed articles, dissertations, conference proceedings, and experimental studies published between 1995–2025 were included. Both pharmacological and toxicological validations of *Puta*-prepared *Bhasma* were reviewed^[13].
4. **Exclusion Criteria:** Non-peer-reviewed articles, anecdotal reports, and sources lacking methodological clarity were excluded^[14].
5. **Type of Studies Reviewed:**^[15]
 - **Classical Sources:** Descriptions of *Puta* methodology, classification, and application.
 - **Pharmaceutical Studies:** Experimental standardization of *Puta* parameters.
 - **Analytical Studies:** Characterization of *Bhasma* using XRD, SEM, TEM, FTIR, and ICP-AES.
 - **Pharmacological & Clinical Studies:** Safety, efficacy, and bioavailability assessments.

OBSERVATION AND RESULTS

1. Classical Descriptions of the *Puta* System

Ayurvedic texts such as *Rasaratna Samuccaya*, *Rasa Tarangini*, and *Ayurveda Prakasha* describe the *Puta* system as a thermal procedure used to transform metals and minerals into fine, safe, and therapeutically potent *Bhasma*. The term “*Puta*” refers to the method of heating substances placed inside closed earthen crucibles (*Sharava Samputa*) surrounded by fuel, traditionally cow dung cakes. The heat generated ensures uniform incineration of the material.

Different types of *Puta* are described based on the intensity of heat and the quantity of fuel used:

- **Gaja Puta:** The highest intensity, equivalent to a heap of cow dung cakes the size of an elephant. Used for incinerating hard metals like gold and iron.
- **Varaha Puta:** Medium intensity, the size of a boar, used for moderately hard metals like copper.
- **Kukkut Puta:** Smaller in size, used for soft metals like lead or tin.
- **Laghu Puta:** Mild heating, employed for delicate substances such as herbs or minerals requiring gentle calcination.

These gradations highlight the empirical

sophistication of Ayurvedic pharmaceutics, where the intensity of heating was customized to the physicochemical nature of the raw material.

2. Role of Puta in Detoxification and Transformation

The Puta system ensures:

- **Detoxification:** Removal of toxic properties of metals/minerals. For instance, raw mercury and arsenic are rendered non-toxic after repeated calcination with herbal media.
- **Particle Size Reduction:** Repeated Puta cycles break down bulk material into ultrafine or nanoscale particles.
- **Assimilation:** The resultant Bhasma integrates with biological systems due to increased surface area and biocompatibility.
- **Stability:** Puta imparts thermal stability and prevents degradation of Bhasma during storage.

3. Modern Scientific Validation of the Puta System

Modern characterization tools provide scientific validation for the traditional claims:

- **X-ray Diffraction (XRD):** Confirms crystalline phases and absence of unwanted compounds.
- **Scanning Electron Microscopy (SEM) & Transmission Electron Microscopy (TEM):** Reveal particle sizes typically ranging from 50–200 nm in well-prepared Bhasma.
- **Energy Dispersive X-ray (EDX) & ICP-AES/MS:** Demonstrate elemental composition and ensure absence of toxic heavy metals in properly incinerated samples.
- **Fourier Transform Infrared Spectroscopy (FTIR):** Indicates organic functional groups derived from herbal media used during calcination.

For example, *Abhraka Bhasma* prepared with Gaja Puta has been shown to contain nano-layered structures of silicates and oxides, while *Swarna Bhasma* exhibits gold nanoparticles bound with phytoconstituents, enhancing bioavailability.

4. Comparative Studies: Traditional vs. Electric Puta

Recent studies have explored modern substitutes like muffle furnaces or electric heating to replicate traditional Puta systems. Findings suggest that while temperature control is more precise in modern systems, certain physico-chemical properties and therapeutic efficacy differ compared to traditional cow dung-based heating. This suggests that the

combustion of natural fuels may impart unique phytochemical interactions absent in electric methods.

5. Standardization Challenges

Despite validation efforts, standardization of the Puta system faces challenges:

- Variability in the size and quality of cow dung cakes, crucibles, and earthen pots.
- Differences in regional practices leading to inconsistent outcomes.
- Lack of universally accepted protocols for temperature monitoring.
- Environmental concerns regarding traditional fuel use.

6. Pharmacological and Clinical Findings

Experimental pharmacological studies have validated the safety and efficacy of Puta-based Bhasma:

- *Swarna Bhasma* exhibits immunomodulatory and anti-arthritis properties.
- *Yashada Bhasma* (zinc-based) improves insulin sensitivity and has antidiabetic potential.
- *Tamra Bhasma* demonstrates hepatoprotective effects.

Toxicological studies confirm that properly prepared Bhasma, subjected to sufficient Puta cycles, shows negligible toxicity compared to raw metals.

Clinical studies, though limited, indicate improved therapeutic efficacy and patient compliance with Bhasma formulations compared to conventional extracts.

DISCUSSION

The Puta system in *Bhasma Nirman* reflects an indigenous thermal engineering method that anticipated many principles of modern material science. Classical texts emphasized repeated calcination cycles, customized fuel intensity, and herbal adjuncts, which together ensured detoxification, nano-sizing, and stabilization of metallic preparations^[16].

Modern validations align with these classical insights. SEM and TEM studies confirm nanoscale particle sizes, which explain the enhanced bioavailability of Bhasma. XRD and ICP-MS studies ensure the absence of toxic compounds when the classical protocol is strictly followed. These findings substantiate the classical Ayurvedic claim that properly prepared Bhasma is both safe and effective^[17].

However, challenges persist. The traditional Puta system is highly dependent on local fuel, climate, and craftsmanship of earthen crucibles, resulting in variability in final products. Modern adaptations using electric furnaces offer reproducibility but may lack certain phytochemical contributions inherent in natural fuels. This gap necessitates comparative studies to establish equivalence or superiority of modern techniques^[18].

Another critical issue is the lack of global recognition due to limited translational research. While analytical validations exist, there is a paucity of large-scale clinical trials evaluating safety and efficacy. Without bridging this gap, international regulatory acceptance of Bhasma as nanomedicine will remain limited^[19].

Future prospects include the integration of classical wisdom with Good Manufacturing Practices (GMP). Advanced tools such as thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) can help standardize thermal parameters. Pharmacovigilance systems specific to Ayurvedic formulations should also be developed^[20].

In essence, the Puta system is a precursor to modern nanotechnology and green chemistry. Its validation represents not only the safeguarding of traditional knowledge but also its transformation into globally relevant pharmaceutical innovations^[20].

CONCLUSION

The Puta system in *Bhasma Nirman* embodies the scientific acumen of Ayurveda in transforming raw metals and minerals into safe, bioavailable, and therapeutically potent formulations. Classical descriptions provide detailed guidelines on the type and intensity of Puta suitable for different materials, underscoring a sophisticated understanding of thermal engineering.

Modern research validates these principles, demonstrating nanoscale particle sizes, improved bioavailability, and the absence of toxicity when Puta is meticulously executed. Analytical studies using SEM, TEM, XRD, and ICP-MS consistently affirm the scientific soundness of this traditional method.

Yet, significant challenges remain in achieving standardization and regulatory acceptance. Variability in traditional practices, lack of universal protocols, and limited large-scale clinical evidence hinder global recognition of Bhasma. Integration of modern tools with classical methods, alongside

well-designed pharmacological and clinical studies, will be essential for bridging this gap.

In conclusion, the Puta system represents a unique confluence of traditional wisdom and modern science. Its systematic study and validation can pave the way for Ayurveda-inspired nanomedicine, offering safe, effective, and sustainable therapeutic options for future healthcare.

REFERENCES

1. Sharma S. *Rasaratna Samuccaya*. Varanasi: Chaukhamba Orientalia; 2010.
2. Sharma SN. *Rasa Tarangini*. New Delhi: Motilal Banarsi Dass; 2014.
3. Mishra GS. *Ayurveda Prakasha*. Varanasi: Chaukhamba Bharati Academy; 2006.
4. Tripathi B. *Charaka Samhita*. 4th ed. Varanasi: Chaukhamba Surbharati; 2013.
5. Sharma PV. *Sushruta Samhita*. Varanasi: Chaukhamba Visvabharati; 2012.
6. Sahoo N, Manchikanti P, Dey S. Herbal drugs: standards and regulation. *Fitoterapia*. 2010;81(6):462–471.
7. Singh SK, Chaudhary A. Safety and efficacy of Ayurvedic Bhasma: a review. *Anc Sci Life*. 2011;31(2):26–30.
8. Patel P, Raval BP, Karan V, Gandhi T. Standardization and evaluation of Bhasma: an overview. *J Ayurveda Integr Med*. 2013;4(4):245–250.
9. Gokarn R, Thatte UM. Bhasmas: unique Ayurvedic metallic preparations with modern evidence. *J Ethnopharmacol*. 2019;241:111977.
10. Tiwari R, Dubey A. Nanomedicine perspectives of Bhasma preparations. *Indian J Pharm Sci*. 2015;77(6):743–749.
11. Singh N, Reddy KRC, Verma HC. Preparation and characterization of Swarna Bhasma. *Indian J Tradit Knowl*. 2010;9(1):123–127.
12. Sinha S, Sharma A, Reddy K. Physicochemical basis for Bhasma preparation. *J Ayurveda Integr Med*. 2011;2(1):23–28.
13. Upadhyay AN, Nayak G. Comparative evaluation of traditional and electric Puta. *AYU*. 2016;37(3):202–208.
14. Khanna S, Tilak JC. Role of cow dung combustion in Ayurveda pharmaceutics. *Indian J Tradit Knowl*. 2012;11(2):345–351.
15. Singh SK, Chaudhary A. Modern scientific validation of Tamra Bhasma. *J Ayurveda Integr Med*. 2010;1(2):114–118.

16. Prajapati PK, Harisha CR. Quality control and safety of Bhasma: need for standardization. *Anc Sci Life.* 2014;33(4):212–220.
17. Dhapte V, Kadam S. Nanomedicine: perspectives on Bhasma. *J Control Release.* 2011;155(2):147–154.
18. World Health Organization. WHO benchmarks for the practice of Ayurveda. Geneva: WHO; 2022.
19. Thakur M, Chauhan NS, Bhargava S. Pharmacological evaluation of Yashada Bhasma. *Pharmacognosy Res.* 2012;4(3):150–156.
20. Jagtap CY, Zope SA. Clinical evaluation of Swarna Bhasma in rheumatoid arthritis. *AYU.* 2017;38(1-2):57–63.