



Review Article

www.ijrap.net

(ISSN Online:2229-3566, ISSN Print:2277-4343)



A COMPREHENSIVE REVIEW OF CLASSICAL SHODHANA PROCEDURES AND PURIFICATION MEDIA OF YASHADA IN RASASHASTRA

Manish Kumar Saini ^{1*}, Pradeep Kumar Prajapati ²

¹ Assistant Professor, Shri Dhanwantry Ayurvedic College and Hospital, Chandigarh, India

² Director, All India Institute of Ayurveda, New Delhi, India

Received on: 02/7/26 Accepted on: 12/8/26

*Corresponding author

E-mail: manishravi007@gmail.com

DOI: 10.7897/2277-4343.174161

ABSTRACT

Shodhana (purification) is a fundamental preliminary processing procedure in Rasashastra (the Ayurvedic science of mineral and metallic pharmaceuticals), used to purify metals and minerals, reduce undesirable properties, and render them suitable for further pharmaceutical use. Yashada (zinc), a low-melting-point metal described in classical Ayurvedic literature, is purified by multiple methods in different texts. This review critically analyses the classical descriptions of Yashada shodhana in Ayurvedic and Rasashastra literature, compares general and drug-specific purification procedures, examines the purification media employed, and situates these classical descriptions alongside available modern analytical evidence. This review was structured in a PRISMA-informed format. Texts listed in Schedule I of the Drugs and Cosmetics Act, 1940, available in physical form, together with other authoritative classical and secondary sources, were screened for procedure type, purification medium, number of repetitions, and textual variation. A PRISMA-style flow diagram, defined eligibility criteria, and a structured data-extraction sheet are reported to improve transparency. Descriptions of Yashada shodhana were identified in 25 classical and secondary texts (9 listed in Schedule I and 16 additional sources). Twenty-one distinct purification media were documented from plant, animal, and mineral sources. Godugdha (cow's milk) was the most frequently cited medium for Vishesh Shodhana, whereas taila, takra, gomutra, kanji, and kulattha kwatha were the media most commonly used for Samanya Shodhana. Repetitions ranged from 3 to 21, depending on the text and procedure. Classical Yashada shodhana represents a deliberate, rationally structured pharmaceutical process. Available modern analytical studies on Yashada bhasma (incinerated ash preparation) lend partial, indirect support to the classical claims of particle-size reduction and phase transformation. Still, direct experimental validation of the shodhana step itself remains limited. The diversity of methods and media reflects a well-developed traditional pharmaceutical rationale and justifies further experimental evaluation.

Keywords: Yashada, Shodhana, Rasashastra, purification media, Ayurvedic pharmaceuticals, PRISMA

INTRODUCTION

Rasashastra is a branch of Ayurvedic pharmaceuticals concerned with converting mercurial substances, metals, and minerals into bio-assimilable forms through structured pharmaceutical processing.¹ These processes vary according to the nature, physical properties, chemical characteristics, and therapeutic utility of the metal or mineral concerned.

The two principal procedures adopted for this purpose are Shodhana and Marana (incineration). Shodhana is an essential preliminary procedure in Ayurvedic pharmaceuticals used to remove toxicity, potentiate metals for therapeutic use, and enhance their digestibility, absorbability, and assimilability. In Rasashastra texts, Shodhana is understood not only as purification but also as a processing step that alters the metal's physical and chemical properties.

Classical Rasashastra texts, including Rasarnava, Rasendrachudamani, Rasaprakasha Sudhakara, Rasaadhyaya, Rasaratna Samuccaya, and Rasamritam, refer to Yashada as Kharpara Satva.^{2,3,4} The first description of Yashada as a metal appears in the Madanapala Nighantu, compiled in the 14th century.⁵ Yashada is classified as a metal and is obtained from natural mineral sources in the Earth's crust, where the raw material may contain unwanted substances that can cause adverse effects if used without purification.

If Yashada is used without proper purification, it may cause disorders such as gulma, prameha, mandanila, shetala, ajirna, vami, bhrama, vatavyadhi, raktapitta, dhatinasha, agnimandhya, and jwara.⁶ Classical Rasashastra authors therefore described several Yashada purification methods. Although classical texts describe individual Yashada shodhana procedures, they remain dispersed and have not been collated into a single analytic, PRISMA-informed framework. This review addresses that gap.

The objective of this review was to compile, compare, and critically analyse the classical procedures and media used for Yashada shodhana in Rasashastra literature; to identify textual variations across sources; and to identify research gaps that can guide future experimental and translational work.

Review Methodology

Review Design

This study was conducted as a structured review of classical Ayurvedic and Rasashastra literature focusing on Yashada shodhana procedures. Because the source material consists of classical textual descriptions rather than clinical or experimental studies, this review was not prospectively registered; the PRISMA 2020 framework was used as a reporting structure to improve transparency in source identification, screening, selection, and data presentation, rather than as a systematic review of trial-based evidence.

Information Sources

Texts listed in Schedule I of the Drugs and Cosmetics Act, 1940, that were available in physical form were consulted, together with other authoritative classical and secondary texts describing Yashada shodhana.

Search Period

The literature search and textual screening were conducted between 2021 and 2023 using the central library and the Departmental Library of Rasashastra and Bhaisajya Kalpana at the All India Institute of Ayurveda, New Delhi, supplemented by texts available to the authors.

Eligibility Criteria

Classical texts were included if they contained: (i) a description of Yashada shodhana; (ii) a purification medium or sequence of

media; and (iii) information regarding repetition, procedure type, or method. Texts were excluded if they did not mention Yashada shodhana, contained only irrelevant references without procedural detail, or repeated the same content without adding textual variation.

Search and Selection Process

Relevant classical texts were screened for descriptions of Yashada shodhana. Extracted information included the type of shodhana, the purification medium used, the number of repetitions, the textual reference, and any variation in sequence or method. Information was grouped into Samanya Shodhana and Vishesha Shodhana for analysis (Table 1 and Table 2). The selection process is summarised in the PRISMA-style flow diagram (Figure 1).

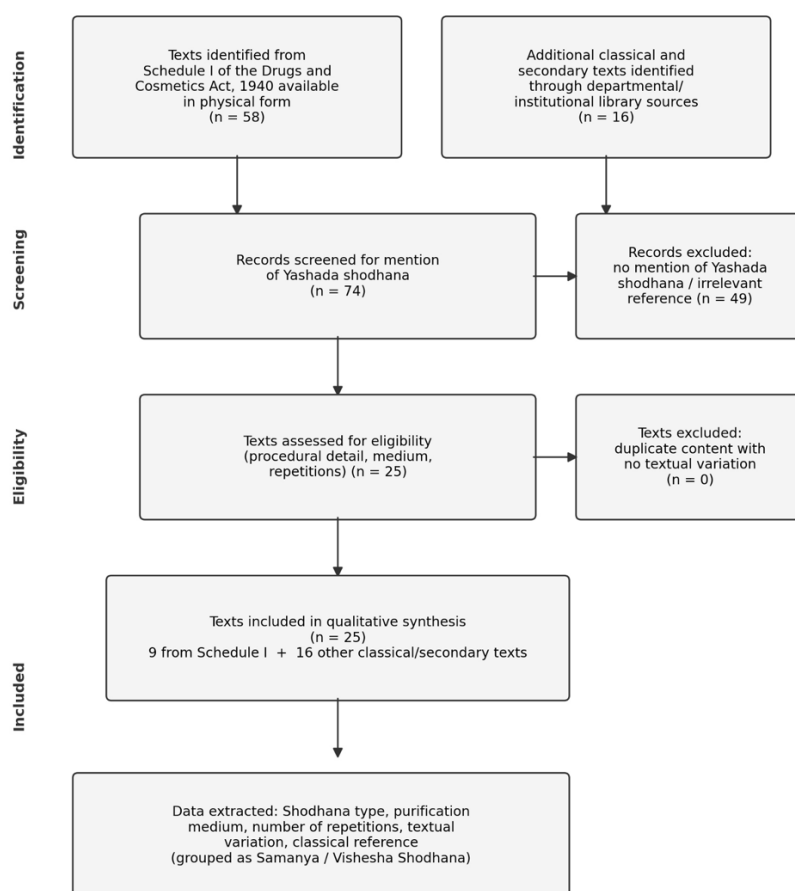


Figure 1: PRISMA-style flow diagram of text identification, screening, eligibility assessment, and inclusion.

Data Items

- Name of the classical text
- Type of shodhana (Samanya/Vishesha)
- Medium or media used
- Number of repetitions
- Notes on repetition or variation
- Textual (classical) reference

Study Classification

Shodhana methods were broadly classified into Samanya Shodhana — a common procedure applied to a group of drugs, with each drug of the group purified individually by a similar method — and Vishesha Shodhana — a specialised, drug-specific

technique. Both categories were further classified as Saagni (heat-based) or Niragni (non-heat-based):

- **Saagni methods:** Nirvapa, Dhalana, Bharjana, Puta, Swedana, Patana
- **Niragni methods:** Bhavana, Prakshalana, Shoshana, Sinchana, Nimajjana, Gharshana

Synthesis Method

Extracted data were compared and synthesised qualitatively. Purification media were grouped as plant-, animal-, or mineral-derived, and procedural variation was assessed by repetition count, medium selection, and application sequence. No quantitative pooling or meta-analysis was attempted, as the

source material is textual and not amenable to statistical synthesis.

Risk of Bias and Quality Considerations

Because this review is based on classical textual sources rather than clinical or experimental studies, conventional risk-of-bias tools (e.g., Cochrane RoB, GRADE) were not directly applicable. Textual consistency across independent sources, frequency of citation, and procedural clarity were instead used as indicators of reliability, consistent with the approach adopted in prior PRISMA-informed reviews of classical Ayurvedic literature.

Classical descriptions of Yashada shodhana

Study Selection

Fifty-eight authoritative Ayurvedic texts are listed in Schedule I of the Drugs and Cosmetics Act, 1940. Of these, nine texts described a method of Yashada shodhana: Ayurveda Prakasha,⁷ Rasa Chandanshu,⁸ Vruhat Rasa Raaj Sundar,⁹ Rasa Tantra Saar Evam Siddha Prayoga Samgraha,¹⁰ Rasa Tarangini,¹¹ Sharngdhar Samhita,¹² Rasamitra,¹³ Ayurveda Saar Samgraha,¹⁴ and the Ayurvedic Formulary of India. A further 16 classical and secondary texts outside Schedule I also described Yashada shodhana: Rasa Jal Nidhi,¹⁵ Rasaamrutam,¹⁶ Rasayan Saar,¹⁷ Rasendra Purana,¹⁸ Rasendra Sampradaya,¹⁹ Rasendra Vigyaniam,²⁰ Rasa Darpan,²¹ Rasendra Bhaskar,²² Bhartiya Rasa Paddhati,²³ Anupaan Manjari,²⁴ Ayurvediya Aushadhi Guna Dharma Shastra,²⁵ Rasa Bindu,²⁶ Rasa Chikitsa,²⁷ Rasa Prakashika,²⁸ Anupan Darpan,²⁹ and Siddha Yoga Samgraha.³⁰ In total, 25 texts met the eligibility criteria and were included in the qualitative synthesis (Figure 1).

General (Samanya) Shodhana Methods

A total of 11 texts (Rasendra Purana and Vruhat Rasa Raaj Sundar, 3 repetitions; Rasamitra, Ayurveda Prakasha, Rasa Chikitsa, Rasa Darpan, Bhartiya Rasa Paddhati, Rasa Jal Nidhi, Rasayan Saar, Siddha Yoga Samgraha, and Ayurveda Saar Samgraha, 7 repetitions) describe a common sequence of taila, takra, gomutra, kanji, and kulattha kwatha for the general purification of Yashada (Table 1). Rasa Tarangini uses the same

media in the order kanji, takra, kulattha kwatha, gomutra, tila taila, repeated 3 times. Rasendra Purana additionally describes a 10-repetition dhalana (melting-and-quenching) sequence using kshara varga, dugdha varga, taila varga, takra varga, mutra varga, amla varga, kanji, ranga varga, pushpa varga, phala varga, rakta varga, and a separate method in which a paste of *Aloe vera* juice, arka dugdha, gunja bija rasa, vida lavana, sajjikshara, geru, and navasadara is applied to a heated metal plate (Table 1).

Specific (Vishesha) Shodhana Methods

Godugdha was the most frequently cited medium for Vishesh Shodhana, used by 17 texts, most commonly with 21 repetitions (Rasa Tarangini, Rasendra Bhaskar, Rasamritam, Rasendra Purana, Rasa Darpan, Bhartiya Rasa Paddhati, Rasa Prakashika, Vruhat Rasa Raaj Sundar, Rasa Jal Nidhi, Rasa Chandanshu, Rasa Tantra Saar Evam Siddha Prayoga Samgraha, Ayurvediya Aushadhi Guna Dharma Shastra, Rasayan Saar, and Ayurveda Saar Samgraha) or 7 repetitions (Rasa Bindu, Siddha Yoga Samgraha). Other specific media reported include sudha dugdha, arka dugdha, churnodaka, nirgundi moola svarasa/kwatha, kanji-gomutra-kadvi loki, nimboo svarasa, haridra-yukta nirgundi svarasa, nara mutra, ashva mutra, kadali kanda svarasa, and kadvi tumbi (Table 2). Rasa Chikitsa, Rasa Darpan, and Ayurvediya Aushadhi Guna Dharma Shastra describe a medium without specifying the number of repetitions.

Key Observations

Screening of the compiled data identified 21 distinct liquid purification media across 25 texts, drawn from plant (n = 12), animal (n = 4), and mineral (n = 5) sources. Plant-derived media included taila, kulattha kwatha, kadali (mool svarasa), ghrita kumari, arka, gunja, sudha, nirgundi, katu tumbi, nimbu, haridra, kadamba, and kanji; animal-derived media included gomutra, nara mutra, ashva mutra, and godugdha; and mineral-derived media included vida lavana, sajjikshara, gerika, navasadara, and churnodaka. Repetitions ranged from 3 to 21, with the dhalana (melting-and-quenching) procedure predominating across texts. Godugdha emerged as the single most frequently cited medium overall, used by 17 of the 25 included texts for Vishesh Shodhana.

Table 1: Common (samanya) shodhana methods of Yashada described in classical texts

Medium sequence	Repetitions	Classical references
Taila, takra, gomutra, kanji, kulattha kwatha	3	Rasendra Purana, Vruhat Rasa Raaj Sundar
	7	Rasamitra, Ayurveda Prakasha, Rasa Chikitsa, Rasa Darpan, Bhartiya Rasa Paddhati, Rasa Jal Nidhi, Rasayan Saar, Siddha Yoga Samgraha, Ayurveda Saar Samgraha
Kanji, takra, kulattha kwatha, gomutra, tila taila	3	Rasa Tarangini
Kadali moola svarasa	3	Rasa Tarangini
	7	Rasamitra, Ayurveda Prakasha, Rasa Chikitsa, Rasa Jal Nidhi
Takra, kanji, gomutra, tila taila, kulattha kwatha	3/7	Ayurveda Prakasha
Taila, takra, kanji, gomutra, kulattha kwatha	3	Rasendra Bhaskar, Sharngdhar Samhita (Dipika tika)
	7	Anupan Darpan
Taila, takra, gomutra, kulattha kwatha, kanji	3	Ayurvediya Aushadhi Guna Dharma Shastra
	7	Rasa Chandanshu
Gomutra, triphala kwatha, takra, kanji, kulattha kwatha	7	Anupan Manjari
Kshara varga, dugdha varga, taila varga, takra varga, mutra varga, kanji/amla varga, ranga varga, pushpa varga, phala varga, rakta varga	10	Rasendra Purana
Aloe vera juice, arka dugdha, gunja bija rasa, vida lavana, sajjikshara, geru, navasadara — applied as paste and heated.	—	Rasendra Purana

Table 2: Specific (vishesha) shodhana methods of Yashada mentioned in classical texts

Specific medium	Repetitions	Classical references
Sudha dugdha	7	Rasa Tarangini, Rasendra Sambhava, Rasa Bindu
Arka dugdha	7	Ayurveda Prakasha
Churnodaka	3	Rasendra Sampradaya
	7	Rasa Tarangini, Rasa Bindu
	Not stated	Rasa Chikitsa
Godugdha	7	Rasa Bindu, Siddha Yoga Samgraha
	21	Rasa Tarangini, Rasendra Bhaskar, Rasamritam, Rasendra Purana, Rasa Darpan, Bhartiya Rasa Paddhati, Rasendra Sambhava, Rasa Prakashika, Vruhat Rasa Raaj Sundar, Rasa Jal Nidhi, Rasa Chandanshu, Rasa Tantra Saar Evam Siddha Prayoga Samgraha, Ayurvediya Aushadhi Guna Dharma Shastra, Rasayan Saar, Ayurveda Saar Samgraha
Nirgundi moola svarasa/kwatha	7	Rasamitra, Rasa Tarangini, Rasendra Sambhava, Bhartiya Rasa Paddhati, Rasa Bindu, Rasa Prakashika
Kanji-gomutra-kadvi loki	7	Rasendra Sambhava
Nimboo svarasa/bijora nimbu	7	Rasendra Vigyaniam, Ayurvediya Aushadhi Guna Dharma Shastra
Haridra-yukta nirgundi svarasa	Not stated	Rasa Darpan
Nara mutra, ashva mutra, takra, kanji	Not stated	Ayurvediya Aushadhi Guna Dharma Shastra
Kadali kanda svarasa	Not stated	Rasa Chikitsa
Mutra varga, amla varga, kshara jala, snuhi dugdha, arka dugdha, kadamba jala (wash)	7	Vruhat Rasa Raaj Sundar
Kadvi tumbi	Not stated	Rasa Darpan

DISCUSSION

Conceptual Basis of Shodhana

Minerals used in Rasashastra are inherently associated with physical and chemical impurities that render them unsuitable for direct internal administration.¹ Classical Ayurvedic literature consistently treats Shodhana as a mandatory preliminary process for detoxifying and transforming these substances into therapeutically acceptable forms. While conventionally translated as "purification," Shodhana extends beyond the mere removal of impurities: it is better understood as a combined detoxification–potentiation intervention that is, in the language of the classical texts themselves, a process of both addition and separation.²

Rationale of Media Selection

The findings of this review indicate that Shodhana is a multifactorial process governed by the nature of the drug, the choice of medium, the sequence of procedures, the duration, and the applied thermal or mechanical energy. Acidic media such as takra, kanji, nimbu svarasa, and triphala kwatha are traditionally understood to weaken metallic bonds through corrosive action. In contrast, alkaline media such as gomutra and kshara dravyas are understood to promote dissolution and extraction of specific impurities. This traditional distinction is broadly consistent with modern corrosion science, in which acidic environments are recognised to reduce hardness and induce structural degradation in metals; a recent study of hard metal corrosion in different acidic media reported that acid exposure reduced hardness by as much as 37% and identified viscosity, specific gravity, and pH as key determinants of the rate of metal degradation.³¹ Repeated heating-and-quenching cycles (3, 7, 10, or 21 repetitions, depending on the text) may plausibly induce thermal stress and progressive microcracking; the classical description of a cumulative, cycle-dependent weakening of the metal is qualitatively consistent with Griffith's original crack-propagation model of brittle fracture, in which pre-existing surface flaws propagate under repeated stress until failure.³²

Among the media examined, Godugdha (cow's milk) is the most frequently cited medium for specific purification, which classical authors associate with imparting biocompatibility to the processed metal. The sequential use of taila, takra, gomutra, kanji, and kulattha kwatha across at least 11 Tantrakaras — spanning oleation, de-fatting, alkaline extraction, and acidic corrosion —

suggests a deliberate, staged pharmaceutical design rather than incidental textual variation.

Correlation with Modern Analytical Evidence

Direct experimental evidence on the Yashada shodhana step itself is limited, and this remains an important gap. However, studies characterising the finished product, Yashada bhasma, provide indirect support for several of the physicochemical claims made in classical texts. Pareek and Bhatnagar prepared Yashada bhasma following the classical Shodhana–Jarana (roasting)–Marana sequence and reported, on X-ray diffraction, conversion of crystalline zinc metal to a hexagonal zinc-oxide phase, together with a substantial reduction in particle size on dynamic light scattering and scanning electron microscopy compared with the raw metal.³³ These findings are consistent with the classical expectation that repeated processing reduces particle size and alters elemental/phase composition, although they characterise the end product after Marana rather than isolating the contribution of the Shodhana step alone. More broadly, bhasma preparations have been proposed as an early, empirically derived form of particle-size engineering, with some authors describing them as a traditional precursor to modern nanomedicine.³⁴ A separate narrative review of Shodhana across Rasashastra similarly concludes that the process functions as a deliberate detoxification–potentiation step rather than simple washing, corroborating the interpretation adopted in the present review.³⁵

These correlations should be read cautiously: none of the cited analytical studies isolates the Shodhana stage of Yashada processing from the subsequent Jarana and Marana stages, so the physicochemical changes attributed here to purification media cannot yet be experimentally disentangled from the effects of incineration. This is precisely the kind of stage-specific validation that the classical descriptions compiled in this review would allow future experimental studies to design.

Critical Synthesis and Current State of the Art

Read together, the classical descriptions and the available modern literature support three convergent conclusions. First, the choice of Shodhana medium is not arbitrary: it tracks a coherent, if implicit, classification by acidity/alkalinity and organic origin that parallels modern categories of corrosive and chelating agents. Second, the repetition-dependent nature of the dhalana procedure (3 to 21 cycles) mirrors fatigue-type, cumulative-damage processes recognised in materials science, rather than describing

a fixed ritual count. Third, the near-universal preference for Godugdha in Vishesh Shodhana across textually independent Tantrakaras is unlikely to be coincidental and is a specific, testable candidate for future comparative experimental work — for instance, comparing the phase composition and particle size of Yashada processed with Godugdha against other traditionally reported media under otherwise identical conditions.

At the same time, the state of the art remains predominantly descriptive. Beyond the corrosion, fracture-mechanics, and bhasma-characterisation literature cited above, there is essentially no published experimental work that isolates the Shodhana stage of Yashada processing, compares outcomes across the different classical media identified in this review, or correlates repetition count with a measurable physicochemical endpoint. The present review therefore functions less as a confirmation of the classical rationale and more as a structured hypothesis-generating framework: it converts a scattered textual record into a specific, testable set of comparisons for future analytical study.

CONCLUSION

Classical literature describes Yashada Shodhana through multiple purification media, both general and specific, with varied repetition patterns across 25 independently authored texts. This breadth suggests a well-developed, internally consistent traditional pharmaceutical approach to preparing Yashada for therapeutic use, and the pattern of media selection is broadly consistent with what modern corrosion and materials science would predict for acid/alkali-mediated metal degradation. At the same time, the existing literature remains textually heterogeneous, and direct experimental validation of the Shodhana step itself — as distinct from the finished bhasma — is still lacking. Future studies should prioritise stage-specific experimental validation of the different purification media and processing sequences identified in this review, together with standardised reporting of all pharmaceutical parameters, to strengthen the scientific basis of Yashada shodhana and support the development of more reliable, reproducible formulations.

RESEARCH GAPS AND FUTURE DIRECTIONS

- Isolate and characterise the Shodhana step specifically (independent of Jarana/Marana) using XRD, SEM/EDAX, particle-size analysis, and elemental profiling for at least the most frequently cited media (Godugdha, taila-takra-gomutra-kanji-kulattha kwatha).
- Conduct head-to-head comparison of media (e.g., Godugdha vs. other Vishesh Shodhana media) under standardised repetition counts.
- Correlate repetition count (3, 7, 10, 21) with measurable indices of structural fatigue/microcracking to test the fracture-mechanics interpretation proposed here.
- Undertake toxicological and bioavailability assessment of Yashada processed by different classical media, to test the claimed detoxification/potential effect directly rather than by extrapolation from finished bhasma studies.

LIMITATIONS

This review is based on classical textual sources and does not include experimental verification of the claimed physicochemical changes at the Shodhana stage specifically. Some texts provide incomplete information on repetition, exact conditions, or apparatus. The review is qualitative in nature, without meta-analysis or quantitative pooling of results, and the correlation drawn with modern analytical studies in the 'Correlation with Modern Analytical Evidence' section is indirect, since those studies characterise finished bhasma rather than the purified metal in isolation.

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Cite this article as:

Manish Kumar Saini and Pradeep Kumar Prajapati. A comprehensive review of Classical Shodhana procedures and purification media of Yashada in Rasashastra. Int. J. Res. Ayurveda Pharm. 2026;17(4):189-194. doi: <http://dx.doi.org/10.7897/2277-4343.174161>

Source of support: Nil, Conflict of interest: None Declared

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