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KSHARAKALPANA: A COMPREHENSIVE REVIEW WITH SPECIAL REFERENCE TO KADALIKANDA KSHARA

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ABSTRACT

Background: Ksharakalpana is one of the most ancient and unique pharmaceutical dosage forms described in Ayurveda, representing alkaline preparations derived from the ashes of medicinal herbs, animal substances, and minerals. Among the numerous plant sources cited in classical texts, *Kadali* (*Musa paradisiaca* Linn.) holds a distinctive place due to its wide therapeutic spectrum. Kadalikanda Kshara, prepared from the corms (rhizomes/pseudostem base) of the banana plant, is referenced across classical Ayurvedic texts for its efficacy in urinary disorders, digestive ailments, and dermatological conditions. **Objectives:** To critically review the concept of Ksharakalpana — its definition, types, properties, method of preparation, and therapeutic indications — with special emphasis on Kadalikanda Kshara as described in classical Ayurvedic literature and supported by contemporary pharmacological investigations. **Methods:** A comprehensive literature review was conducted by consulting authoritative classical Samhitas (Sushruta Samhita, Charaka Samhita, Ashtanga Hridayam, Sharangadhara Samhita, Rasa Tarangini), modern Ayurvedic pharmacopoeial standards, and contemporary peer-reviewed research publications available in PubMed, Google Scholar, and related databases up to 2025. **Results:** Ksharakalpana is broadly classified into Paneeya (internal/drinkable) and Pratisaraniya (external/applicable) types, with further sub-classifications based on potency and source material. Kadalikanda Kshara, derived from *Musa paradisiaca*, exhibits Ushna (hot), Tikshna (sharp), Katu (pungent), Lekhana (scraping), and Shothahara (anti-inflammatory) properties. It is indicated in Mutrashmari (urolithiasis), Udara roga, Arsha, Kushtha, and Shwasa. Physicochemical analysis reveals high alkalinity (pH 9–12), significant potassium and calcium content, and antifungal and antibacterial activity. **Conclusion:** Ksharakalpana remains a therapeutically potent and versatile Ayurvedic formulation. Kadalikanda Kshara warrants further standardised analytical and clinical research to validate its classical indications and to establish quality control parameters for contemporary pharmaceutical application.

KEYWORDS: *Ksharakalpana, Kadalikanda Kshara, Musa paradisiaca, Paneeya Kshara, Pratisaraniya Kshara, Mutrashmari, Alkaline preparation, Ayurveda pharmaceutics.*

1. INTRODUCTION

Ayurveda, the science of life, has documented a sophisticated system of pharmaceutical preparations known as Kalpanas — each designed to harness the therapeutic potential of medicinal substances in an optimised form. Among these, Ksharakalpana occupies a position of particular clinical significance, being designated by Acharya Sushruta as superior even to surgical instruments (Shastras) in certain clinical scenarios due to its ability to perform incision (Chedana), scraping (Lekhana), cauterisation (Dahana), and purification of diseased tissues simultaneously.[1]

The term "Kshara" is etymologically derived from the Sanskrit root *Ksha + ra* — meaning that which corrodes, flows down, or causes disintegration of vitiated tissues (*Ksharanat ksharati iti Ksharah*). This caustic alkaline preparation is described in detail in the Sutrasthana of Sushruta Samhita,[1] in the Kalpasthana of Charaka Samhita,[2] and in the Sutrasthana of Ashtanga Hridayam.[3] The therapeutic scope of Kshara extends across Shalya Tantra (surgical branch), Kayachikitsa (internal medicine), and Rasashastra (Ayurvedic pharmaceutics).

Among the many plant sources identified for Kshara preparation — including *Apamarga* (*Achyranthes aspera*), *Snuhi* (*Euphorbia nerifolia*), *Arka* (*Calotropis gigantea*), and *Mulaka* (*Raphanus sativus*) —[7,8] Kadali (*Musa paradisiaca* Linn.) merits special attention. Its corm (Kanda), pseudostem (Vamsha), and whole plant have been deployed in various Kshara formulations.[15,18] Kadalikanda Kshara is referenced in classical texts for urinary calculi, abdominal disorders, haemorrhoids, and dermatological conditions,[10,14] and has been the subject of recent pharmacological investigation confirming its antifungal, diuretic, and lithotriptic properties.

This review aims to consolidate classical textual references and contemporary scientific evidence pertaining to Ksharakalpana in general and Kadalikanda Kshara in particular, to provide a comprehensive pharmaceutical and therapeutic profile that may serve as a foundation for further standardised research.

2. AIMS AND OBJECTIVES

The present review was undertaken with the following objectives:

1. To review the classical concept, definition, and etymological significance of Ksharakalpana.
2. To classify the types of Kshara as described in Ayurvedic Samhitas.
3. To document the pharmaceutical method of preparation (Nirman Vidhi) of Kshara as per classical references.
4. *To critically examine the properties, indications, and contraindications of Kadalikanda Kshara (Musa paradisiaca Linn.) as per classical and contemporary sources.*

3. MATERIALS AND METHODS

The present work is a classical literary and contemporary scientific review. Primary classical references were gathered from authoritative Ayurvedic texts including Sushruta Samhita (Sutrasthana, Kalpasthana),[1] Charaka Samhita (Kalpasthana),[2] Ashtanga Hridayam (Sutrasthana),[3] Sharangadhara Samhita (Madhyama Khanda),[4] Rasa Tarangini,[5] Bhaishajya Ratnavali,[14] and the Ayurvedic Pharmacopoeia of India (API).[6] Secondary sources comprising peer-reviewed journal articles published between 2000 and 2025 were retrieved from PubMed, Google Scholar, ResearchGate, and Ayurvedic institutional repositories. Sanskrit terms have been transliterated using standard Ayurvedic conventions, and botanical nomenclature follows the accepted taxonomic classification for *Musa paradisiaca* Linn.

4. REVIEW AND DISCUSSION

4.1 Definition and Etymology of Kshara

The term Kshara has been variously defined across classical texts. Acharya Sushruta defines it as: "*Yat ksharayet dosham tat Ksharam*" — that which eliminates the morbid Doshas from the body is Kshara.[1] Charaka describes Kshara as substances derived from the incineration of medicinal drugs whose caustic alkaline constituents are extracted through a systematic aqueous filtering process.[2] The Sharangadhara Samhita further elaborates the pharmacological basis of the preparation as a concentrated alkaline extract.[4]

The substance is called Kshara because of its property of Ksharana — the ability to disintegrate, erode, and eliminate vitiated tissues, Doshas, and metabolic waste products (Ama). The word Kshana also implies instantaneous action, reflecting the rapid therapeutic effect characteristic of these preparations.[7,8]

4.2 Classification of Kshara

Classical texts provide multiple classifications of Kshara based on route of administration, potency, source, and method of preparation. The principal classification recognised across Samhitas is as follows:[1,2,4]

Table 1: Classical Classification of Kshara.

Basis of Classification	Type	Description
Route of Administration	Paneeya Kshara (Internal)	Taken orally; milder in potency; used for systemic diseases (Mutrashmari, Gulma, Arsha, Udara roga)
	Pratisaraniya Kshara (External)	Applied locally to diseased tissue; stronger potency; used in Bhagandara, Arsha, Dushta Vrana, skin lesions
Potency	Mridu (Mild)	Gentle action; prepared from fewer ingredients; suitable for sensitive patients
	Madhyama (Moderate)	Intermediate potency; balanced pharmacological action
	Tikshna (Sharp/Potent)	Strongly caustic; used in resistant lesions; requires careful application
Source Material	Eka Kshara (Single herb)	Derived from one plant source, e.g., Kadalikanda Kshara, Apamarga Kshara
	Yavakshara / Mishrakashara (Compound)	Prepared from multiple plant sources; broader therapeutic spectrum

4.3 General Method of Preparation of Kshara

The general method of preparation as described in Sushruta Samhita (Sutrasthana 11)[1] and corroborated by Sharangadhara Samhita (Madhyama Khanda 11)[4] involves the following sequential steps:

Step 1 — Dravya Sangraha (Collection of Raw Material): The medicinal plant designated as the Kshara source is collected during Sharad Kala (autumn season, approximately October–November) from a clean, unpolluted environment.[1] The whole plant or the appropriate part (stem, root, corm) is collected at physiological maturity to ensure maximum alkaloid and mineral content.

Step 2 — Dahana (Incineration): The collected plant material is dried under shade to remove moisture and subsequently subjected to controlled incineration in a pit or open clay vessel. The material is burnt to a uniform grey-white ash (Bhasma/Kshara) ensuring complete combustion.[4,11]

Step 3 — Kvatha (Leaching/Aqueous Extraction): The collected ash is dissolved in water (Jala) or Gomutra (cow's urine) in a prescribed ratio — classically one part ash to four to six parts liquid.[1] The mixture is thoroughly stirred and allowed to settle overnight (Shayana) for complete leaching of alkaline salts.

Step 4 — Filtration (Pravahana/Nissanda): The soaked mixture is filtered through multiple layers of clean white cloth (Vastragalita). Sushruta specifies twenty-one folds of cloth for Pratisaraniya Kshara, while seven-fold filtration is described for Paneeya Kshara,[1] ensuring clarity and removal of particulate matter.

Step 5 — Concentration (Paka): The filtered alkaline filtrate is subjected to gentle evaporation over a controlled fire (Mandagni) with continuous stirring until a semi-solid or solid residue of appropriate consistency is obtained.[4]

Step 6 — Quality Assessment (Kshara Pariksha): The finished Kshara is examined for appropriate colour (typically white to off-white), odour (characteristic alkaline), taste (alkaline/pungent), texture, and pH. A well-prepared Kshara should neither stick to the fingers, crumble, nor emit a foul odour.[1,8]

4.4 General Properties (Guna) and Pharmacodynamics of Kshara

Acharya Sushruta (Sutrasthana 11) describes ten cardinal properties of well-prepared Kshara that guide its clinical application:[1]

Tridoshaghna (pacifies all three Doshas) | *Soumya (pleasant, mild)* | *Dahana (cauterising)* | *Pachana (digestive/maturing)* | *Darana (bursting action on pathological tissue)* | *Kledana (moistening)* | *Shoshana (desiccating)* | *Stambhana (styptic, arrests bleeding)* | *Ropana (wound healing)* | *Lekhana (scraping of excess tissue)*

Acharya Charaka (Kalpasthana 1) additionally emphasises the Deepana (appetiser), Pachana (digestive), and Vatanulomana (carminative) properties of internally administered Kshara.[2] The wide-ranging pharmacodynamic profile of Kshara arises from its alkaline pH, rich mineral content (predominantly potassium, calcium, and sodium carbonates), and the

bioactive phytochemical residues preserved within the ash matrix.

4.5 Indications and Contraindications of Kshara (General)

Classical texts enumerate a broad range of conditions amenable to Kshara therapy:[1,2,3,8]

Table 2: Therapeutic Indications and Contraindications of Kshara (General)

Indications (Yogya)	Contraindications (Ayogya)
Arsha (Haemorrhoids)	Pregnancy (Garbhini)
Bhagandara (Fistula-in-ano)	Children (Bala) — internal use
Dushta Vrana (Infected/chronic wounds)	Elderly (Vriddha) — with caution
Ashmari (Urinary calculi)	Pitta-dominant constitution (Tikshna Agni)
Gulma (Abdominal tumours/masses)	Conditions with excessive bleeding
Kushtha (Skin diseases)	Ocular disorders — internal strong Kshara
Charmakeela (Corns, warts)	Debilitated patients (Durbala)
Udara roga (Abdominal diseases)	Post-operative patients on restricted diet

4.6 Kadalikanda Kshara — Source Plant Review

Kadali (*Musa paradisiaca* Linn., Family: Musaceae) is among the oldest cultivated plants in tropical and subtropical Asia, held in veneration in Ayurveda under numerous synonyms including *Rambha*, *Mochaka*, *Vanalakshmi*, *Kadali*, and *Kadalika*.[13,18] The plant is a tall, perennial, monocotyledonous herb with a fibrous pseudostem (false stem composed of leaf sheaths), a true underground rhizome (corm or Kanda), large paddle-shaped leaves, pendant inflorescence, and nutritive fruits.

In Ayurvedic pharmaceutics, the Kanda (corm/rhizome base and the innermost pseudostem core) has been accorded special importance. The juice of the pseudostem is used in the Shodhana (purification) of metals such as Vaikranta and Swarnamakshika, and in the incineration processes of Abhraka (Mica),[15] demonstrating the mineral-rich, alkaline character of the plant.

Table 3: Botanical and Ayurvedic Profile of Kadali (Musa paradisiaca)

Parameter	Details
Botanical Name	Musa paradisiaca Linn. / Musa sapientum
Family	Musaceae
Sanskrit Synonyms	Kadali, Rambha, Mochaka, Vanalakshmi, Guchhaphala, Rajaphala
Rasa (Taste)	Madhura (sweet), Kashaya (astringent)
Guna (Quality)	Guru (heavy), Snigdha (unctuous)
Vipaka (Post-digestive taste)	Madhura (sweet)
Veerya (Potency)	Sheeta (cooling) — fruit; Ushna tendency in Kshara form
Dosha Karma	Vatapittashamaka, Kaphakara (fruit); Kshara form — Tridoshaghna tendency
Parts Used for Kshara	Kanda (corm/pseudostem base), Vamsha (pseudostem), Patra (leaf)
Varga (Classical Group)	Phalavarga (fruit group) in most Nighantus; Kshara Dravya when processed

4.7 Preparation of Kadalikanda Kshara

The preparation of Kadalikanda Kshara follows the standard Kshara Paka Vidhi as outlined in Sushruta Samhita (Sutrasthana 11)[1] and Sharangadhara Samhita (Madhyama Khanda 11/75–80),[4] with specific adaptation for the Kadali plant material:

Material Collection: The corms (rhizomes/pseudostem base) of physiologically mature *Musa paradisiaca* plants are selected, thoroughly washed, cut into small uniform pieces (approximately 2–3 cm), and dried in shade for 7–10 days until completely moisture-free.

Incineration (Dahana): The dried Kanda pieces are placed in a frying pan or open clay vessel and subjected to complete incineration over direct heat, burnt to a fine grey-white ash without permitting incomplete charring. The ash is weighed and stored in a clean sealed container.[9]

Aqueous Extraction: The ash is mixed with clean water in a 1:4 ratio by weight as per Sushruta's guideline.[1] The mixture is vigorously stirred and allowed to soak overnight (approximately 12 hours) for complete leaching of alkaline salts.

Filtration: The alkaline solution is filtered through seven or twenty-one folds of clean white cloth (Vastragalita) depending on whether Paneeya or Pratisaraniya Kshara is being prepared, until the filtrate is clear and free of suspended particles.[1,4]

Concentration (Paka): The clear filtrate is concentrated on a low flame (Mandagni) with continuous stirring. For Paneeya Kshara, the product is concentrated to a hygroscopic powder or crystalline form. For Pratisaraniya use, evaporation is continued to a semi-solid consistency suitable for topical application.[4,11]

Storage: The finished Kshara is stored in an air-tight glass or ceramic container in a cool, dry place, away from moisture and direct sunlight.

4.8 Physico-chemical Profile of Kadalikanda Kshara

Contemporary analytical studies on Kadali Kshara and related banana plant ash preparations have yielded important physicochemical data.[9,10,11] The ash of *Musa paradisiaca* corm demonstrates a strongly alkaline pH (typically 9–12), consistent with potassium carbonate (K_2CO_3) and potassium hydroxide (KOH) as the predominant alkaline species.[9] The ash is rich in potassium (K), calcium (Ca), magnesium (Mg), and phosphorus (P) — a mineral profile that explains the diuretic, lithotriptic, and anti-inflammatory pharmacological actions attributed to the preparation in classical texts.

Table 4: Reported Physicochemical Parameters of Kadalikanda Kshara.

Parameter	Observed Value	Clinical Significance
Colour	White to off-white	Indicates purity of incineration
pH	9.5 – 12.0	Confirms alkaline nature; therapeutic caustic action
Moisture Content (% w/w)	< 5%	Stability criterion
Total Alkalinity (as K2CO3)	High (major constituent)	Primary pharmacological agent
Potassium (K)	Predominant cation	Diuretic, lithotriptic effect
Calcium (Ca)	Significant	Haemostatic, tissue-healing property
Antifungal Activity	Demonstrated in vitro	Supports use in skin fungal conditions
Loss on Ignition	Assessed for Bhasma quality	Purity assessment

4.9 Therapeutic Indications of Kadalikanda Kshara

Classical texts mention multiple conditions amenable to treatment with Kadali Kshara in either its Paneeya (oral) or Pratisaraniya (topical) form:[1,2,14]

Mutrashmari (Urolithiasis): Paneeya Kadali Kshara administered at 500 mg twice daily with honey is described for the dissolution and expulsion of urinary calculi.[10] The high potassium content and alkalising action promote dissolution of uric acid and oxalate calculi and enhance urine volume through a diuretic effect, facilitating stone passage. This indication is corroborated by a recent case study demonstrating favourable outcomes with Kadali Kshara in a female patient with confirmed urolithiasis over a 28-day treatment course.

Arsha (Haemorrhoids): Both Paneeya and Pratisaraniya forms are indicated in Arsha.[1,8] Internal administration reduces Kapha-Vata Dosha, improves Agni (digestive fire), and alleviates constipation. External application to

haemorrhoidal masses produces controlled cauterisation, leading to shrinkage of the tissue.

Kushtha and Dermatological Conditions: In Kushtha (skin disorders), Kadalikanda Kshara serves as an alkaline exfoliant and antimicrobial agent.[9] A recent controlled clinical study evaluated a cream formulation of Kadali Kshara (30% w/w in emulsifying ointment base) in thirty patients with Pityriasis versicolor. The trial demonstrated statistically significant reduction in lesion area in the treatment group compared to the control group over four weeks,[9] validating the classical indication.

Udara Roga and Shwasa: Classical texts such as Bhaishajya Ratnavali[14] and Charaka Samhita[2] describe Kadali Kshara as useful in abdominal distension, ascites, and respiratory disorders. Its Deepana-Pachana (appetiser-digestive) and Vatanulomana (carminative) properties make it suitable for managing Kapha-Vata-predominant abdominal disorders.

Shotha (Inflammatory Conditions) and Ashmari: The anti-inflammatory and lithotriptic properties of Kadali Kshara are attributed to its alkaline pH and mineral-rich composition.[10,12] The juice of the banana pseudostem has been documented in folk medicine traditions across South Asia for dissolving renal calculi,[12] and the Kshara preparation concentrates these properties into a standardisable pharmaceutical form.

4.10 Dosage, Anupana, and Method of Administration

The classical dose of Paneeya Kshara is described as Kola matra (approximately 3–5 grams) to Karsha matra (approximately 10 grams) per day in divided doses,[1,2] depending on patient constitution, severity of disease, and digestive capacity (Agni). Contemporary research on Kadali Kshara has employed dosages of 250 mg to 1 gram per dose, administered twice daily under physician supervision.[10]

Anupana (vehicle) recommendations include honey (Madhu) — the most commonly cited adjuvant for Paneeya Kshara[1,10] — warm water, buttermilk (Takra), or specific decoctions tailored to the underlying condition. Honey enhances absorption and counteracts the excessively Ushna (hot) nature of potent Kshara preparations.

For Pratisaraniya (external) application, the semi-solid Kshara is applied to the diseased area using a probe or spatula for a precise duration (typically 1–3 minutes) under clinical supervision,[1] followed by application of Madhughrita (honey and ghee mixture) to neutralise residual caustic action and promote healing.

4.11 Adverse Effects and Precautions

Acharya Sushruta clearly warns that improperly prepared or excessively potent Kshara, or Kshara employed in contraindicated conditions, can produce serious adverse effects including: Pitta aggravation and burning sensation (Daha), excessive corrosion of healthy tissue (Atidahana), loss of vision (Andhatva) when applied near the eyes, and in severe cases, complications of a potentially irreversible nature.[1] Oral overdose may produce gastric irritation, Pitta vitiation, and electrolyte imbalance due to excessive potassium intake.

Kadalikanda Kshara, though categorised as a relatively milder Kshara compared to Apamarga or Snuhi Kshara,[7,8] must nonetheless be prepared and administered under qualified Ayurvedic supervision. Its use in pregnancy, in individuals with renal insufficiency, in those with severe Pitta constitution (Pitta Prakriti), and in children without appropriate dose modification should be avoided.

4.12 Comparison with Other Established Kshara Preparations

Table 5: Comparative Profile — Kadalikanda Kshara vs. Commonly Used Kshara Preparations.

Parameter	Kadalikanda Kshara	Apamarga Kshara	Snuhi Kshara	Mulaka Kshara
Source Plant	Musa paradisiaca	Achyranthes aspera	Euphorbia nerifolia	Raphanus sativus
Potency	Mild to Moderate	Moderate to Sharp	Sharp (Tikshna)	Mild
Primary Indication	Mutrashmari, Arsha, Kushtha, Udara	Arsha, Bhagandara (Kshara Sutra), Gulma	Arsha, Bhagandara (external)	Urinary conditions, Ashmari
Dosha Emphasis	Kapha-Vata	Kapha-Vata	Kapha-Vata	Kapha-Pitta
Modern Research	Emerging; antifungal, lithotriptic studies	Well-studied; Kshara Sutra RCTs available	Moderate; wound healing studies	Limited

5. CONCLUSION

Ksharakalpana represents a sophisticated and clinically potent Ayurvedic pharmaceutical tradition with

documented efficacy spanning more than two millennia.[1,2,7] Its dual utility as a systemic internal preparation (Paneeya Kshara) and as a controlled topical caustic agent (Pratisaraniya Kshara) places it uniquely at the intersection of Ayurvedic internal medicine and surgical therapeutics.

Kadalikanda Kshara, derived from the corms of *Musa paradisiaca* Linn., emerges from this review as a pharmaceutically promising, therapeutically broad-spectrum, and relatively safe Kshara preparation whose classical applications in Mutrashmari, Arsha, Udara roga, and Kushtha have begun to find contemporary scientific validation.[9,10] Its antifungal activity in Pityriasis versicolor, lithotriptic potential in urolithiasis, and mineral-rich alkaline composition provide a compelling pharmacological rationale for its traditional use.

However, significant lacunae remain in the current evidence base: standardised, reproducible analytical protocols for quality control of Kadali Kshara are yet to be formally incorporated into the Ayurvedic Pharmacopoeia of India;[6] dose-response relationships are inadequately characterised; and large-scale, randomised controlled clinical trials remain conspicuously absent. The development of validated analytical markers (such as potassium carbonate quantification, pH standards, and TLC profiling of residual phytochemicals), combined with well-designed clinical trials adhering to CONSORT or PRISMA guidelines, represents the most productive direction for future research.

In summation, Ksharakalpana — and Kadalikanda Kshara in particular — merits renewed scholarly and scientific attention as Ayurveda increasingly engages with evidence-based global healthcare. The integration of rigorous contemporary methodology with the rich wisdom embedded in classical texts holds the greatest promise for validating and expanding the therapeutic application of this ancient and remarkable pharmaceutical tradition.

CONFLICT OF INTEREST

The author(s) declare no conflict of interest.

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