

PREPARATION AND CHARACTERIZATION OF HERBO-MINERAL BHASMA (NYCTANTHES ARBOR-TRISTIS)

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Article Received: 03 May 2025 | Article Revised: 24 May 2025 | Article Accepted: 15 June 2025

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DOI: <https://doi.org/10.5281/zenodo.15779223>

How to cite this Article Adiya Kumar, Nidhi Chaudhary, Krati, Dr. Esha Vatsa, Dr. Amandeep Singh (2025) PREPARATION AND CHARACTERIZATION OF HERBO- MINERAL BHASMA (NYCTANTHES ARBOR-TRISTIS). World Journal of Pharmaceutical Science and Research, 4(3), 629-644. <https://doi.org/10.5281/zenodo.15779223>



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ABSTRACT

Metals are used in Ayurveda and other Indian medical systems, although their use dates back to 2500 B.C. in Chinese and Egyptian civilizations. Known in the Indian subcontinent since the 7th century A.D., Bhasma is a special ayurvedic metallic/mineral preparation that is treated with herbal juice or decoction and exposed for Ayurveda, which is widely recommended for the treatment of a variety of chronic conditions. Bhasma is typically supplied as animal derivatives, including horns, shells, feathers, metallic and nonmetallic substances, and herbals. A Bhasma is an ash that is produced by burning; the starting material goes through a complex purification process, which is followed by the reaction phase, which includes adding additional minerals and/or herbal extract. Maintaining optimal alkalinity for optimal health and neutralizing toxic acids that cause illness are just two of Bhasma's many benefits. Since Bhasma is not metabolized, it breaks down heavy metals in the body instead of producing any detrimental metabolites. Parpati, rasayoga, sindora, and other techniques are used to prepare Bhasma. Bhasma that contains Fe, Cu, or S, or other manufacturing processes, contributes in a particular way to the end product or products. Significantly smaller particles (1-2 μ) may make it easier for the medicine to be absorbed and assimilated into the human system. Bhasma must be standardized in order to verify its authenticity and assess the product's quality, safety, efficacy, and acceptance. However, the most significant issue with these formulations is that they are not fully standardized by physiochemical criteria. The area of Ayurveda known as Rasa-Shastra focuses on providing a thorough description of metallic and nonmetallic substances as well as goods derived from animals in order to convert them into dosage forms.

KEYWORDS: Ayurveda, Nanomedicine, Bhasma, Rasa-Shastra, Herbo-metallic.

1. INTRODUCTION

Herbo-mineral formulations offer a comprehensive approach to therapy by combining the therapeutic benefits of both plant-based and mineral-based medicine. Because of its important medicinal qualities, Parijat Bhasma, which is made from *Nyctanthes arbor-tristis* (also called Parijat or Night-flowering Jasmine), is one of the many Bhasma preparations that is frequently employed in Ayurveda. The effectiveness of this formulation in treating skin conditions, fever, arthritis, and other chronic illnesses is well-established.

Ayurvedic classics like Rasashastra, Charaka Samhita, and Sushruta Samhita have extensively chronicled the idea of Bhasma preparation. In order to improve their medicinal qualities and transform the ingredients into biocompatible forms, these formulations go through a number of purification processes, several cycles of burning, and grinding with herbal juices (Bhavana).

Veda and Ayush, which translate to "knowledge of life," make up Ayurveda. The Ayurvedic system uses a variety of methods to address people's mental, emotional, and spiritual well-being. One such Ayurvedic method, Rasa-Shastra, addresses herbo-mineral preparations, such as Bhasmas. These formulations are nontoxic and easily absorbed, and they have the capacity to target medications at the site of action. Bhasma is subjected to controlled heat and treated with herbal juices during the preparation process. These procedures turn Bhasma into a nanomedicine that is said to be biologically absorbed as nanoparticles.

Bhasma are herbo-mineral-metallic substances with nanoscale sizes between 5 and 50 nm. Numerous contemporary microscopy and spectroscopic methods attest to this. Numerous chronic illnesses are treated with these herbo-mineral-metallic complexes. Converting these metal/mineral-based medications from their initial metallic state to an oxide state maximizes their effectiveness. Metal is transformed into its higher oxidation state during the manufacturing process known as Bhasmikarana. This technique gives metals their therapeutic usefulness while removing their toxicity. In order to create Bhasma nanomedicines, Bhasmikarana uses a number of purifying and incineration procedures that drastically reduce particle size.

All of these procedures transform Bhasma into a form that is biocompatible, absorbable, and bioassimilable. As a result, Bhasmikarana not only makes metal particles smaller, but it also makes Bhasma more suited for human anatomy. Bhasma nanoparticles can be described as organometallic complexes with enhanced efficacy, stability, absorption, and bioavailability.

An estimated 14% of sick people in India are thought to use the Indian medical system. According to personal choice, 18.7% of people use Ayurveda for common illnesses, 7.1% for illnesses, and 5% for severe illnesses.^[1] According to a World Health Organization (WHO) research, a large number of people in underdeveloped nations continue to use herbal therapy. The majority of people think that, in contrast to contemporary chemotherapeutic treatments, herbal remedies are harmless and safe. In order to have the desired effect, people typically utilize herbal medicine for extended periods of time.

On the other hand, it has been noted that the concentration of heavy metals in herbal medications used in China and the Indian subcontinent is higher than in other regions.^[3,5] One of five South Asian-made Ayurvedic herbal medicines, according to another investigation, contains elevated amounts of arsenic, mercury, and lead.

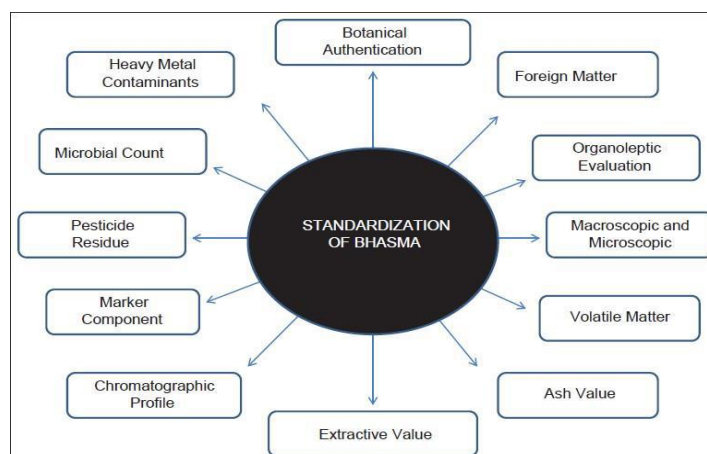
Nonetheless, heavy metals have been utilized for ages and are essential to certain formulas.^[8] Different raw material techniques, such as trituration, heating, and purification, are used to create Ayurvedic medicines. Consequently, substances included in final goods do not cause toxicity. The toxicity of heavy metals is noted in Ayurvedic textbooks, which also suggest specific pharmaceutical procedures to detoxify them. A number of contaminants may be present in those metals that are extracted from ores. The Shodhana method eliminates these contaminants. The Shodhana process separates contaminants and eliminates undesired parts from the raw material.

Shodhana, as used in Bhasma, refers to cleansing and preparing the product for Marana, the following stage. Shodhana is divided into two categories by Ayurveda: general process and particular process. The main approach for Shodhana involves heating metal sheets until they are red hot and then repeatedly dipping them into liquids like as buttermilk, oil, cow's urine, etc., a process that is performed seven times. In a certain procedure For various metals, Shodhana describes a particular procedure. For example, to purify Jasada, the molten mass is poured 21 times in cow's milk. The importance of heavy metals for the healthy operation of the human body is emphasized in ayurvedic textbooks. According to Rasa Shastra, metals and minerals are also referred to as "Dhatus" and "Updhatus" due to their unique function in biological systems, namely the ability to support bodily tissues by supplying them with certain essential elements, the lack of which results in numerous undesirable issues or illnesses. The literature on Ayurveda that is now available emphasizes the importance of metals in preserving the body's metabolic balance. Mercury, gold, silver, copper, iron, tin, lead, zinc, and so on are examples of these metals. Anabolic and metabolic problems can result from any excess, imbalance, or shortage in these metals' composition. Strong immunity is based on the metals' equilibrium state in the human body. As a result, any imbalance in these metals' composition could lead to illnesses, and their equilibrium is thought to be a prerequisite for both general health and a healthy immune system. Therefore, to create herbometallic medications, heavy metals from the outside are purposefully added and treated with herbal plants. The metallic powders are always treated with fresh herb juices prior to burning in order to counteract their toxicity. To ensure that the metal's toxicity or weight is eliminated, some of the metals are burned up to 100 times. When the "Bhasma" is prepared, its toxicity is examined. One of the several tests the Bhasma must pass is called "Varitar," which indicates that there are no heavy metals in it after it is ready for internal usage because it floats on water. After that, the "Bhasma" are combined with herbal powders to create compound formulations.

The chemical formula is processed using special herbal juices to produce non-toxic herbometallic compounds instead of any more hazardous metals. Consequently, it is asserted that heavy metals are detoxified using herbal extracts and eliminated from the body without causing any harm. Bhasmas are metal preparations that undergo Samskaras, a physico-chemical processing method, to preserve their medicinal qualities while purifying and detoxifying them. According to estimates from Ayurvedic experts, 35–40% of the roughly 600 medications in the Ayurvedic formulary purposefully contain at least one metal. Conversely, some plant species have a strong propensity to absorb specific metal residues from the soil.

1.1 Standardization of Bhasma

Table 1: Standardization of Bhasma.



1.2. PLANT INTRODUCTION

The *Nyctanthes* species Parijat (*Nyctanthes Arbor-Tristis*), commonly referred to as the Night-Flowering Jasmine or Coral Jasmine, is native to South and Southeast Asia. Parijat belongs to the family Oleaceae. Although the genus *Jasminum* has a common name, the plant is neither a "genuine jasmine" nor even a member of that family. Parijat grows in the outer Himalayas and can be found in areas of Assam, Bengal, and Tripura to the east, as well as in Jammu & Kashmir, Nepal, and the central region up to the Godavari in the south. They can be found in Pakistan, Nepal, Thailand, and Indonesia in addition to India.

The tree is often called the "tree of sorrow" since the blossoms lose their color during the day. *Arbor-tristis* also translates as "sad tree." Parijat is also known as "Harsingar or The Gods' Ornament" in India. It is the only flower that can be lifted from the ground and presented to the gods because of this. Additionally, it is said that the flower aids in remembering past incarnations and lifetimes.

One of the mysterious and alluring plants is parijat, whose blossoms fall to the ground. As the light rises, the blooms fall from the trees after opening up during night. The atmosphere is filled with the wonderfully fragrant floral perfume of these lovely blossoms. The parijat plant is perfect for outdoor gardening and sunny balconies. Because of its many therapeutic uses, parijat (*Nyctanthes arbor-tristis*), sometimes referred to as harsingar, is a highly valued plant in Ayurveda. Traditional medical systems have been using it for millennia to treat a variety of illnesses. The entire plant has medicinal value, including the leaves, flowers, bark, seeds, and roots. Parijat is a plant with hot potency, a bitter and astringent taste, and a primary function of balancing the body's Vata and Kapha doshas, according to Ayurveda.



Fig. 1: Parijat.

Parijat's ability to effectively cure fevers, particularly chronic and sporadic fevers like dengue and malaria, is one of its best-known advantages. It is well known for boosting immunity against infections and is frequently used as a natural antipyretic in leaf decoction. In addition to fever, parijat works well for arthritis and joint discomfort. Due to its strong anti-inflammatory characteristics, it assists in lowering swelling and stiffness, making it good for persons suffering from rheumatism or gout.

Another well-known treatment for respiratory conditions is parijat. Asthma, bronchitis, and persistent cough are frequently treated with its roots and leaves. The plant's expectorant qualities relieve congestion and breathing problems by removing mucus from the respiratory tract. It is also helpful in treating lung and throat infections due to its antibacterial properties.

Parijat's effects on digestive health provide yet another significant advantage. It is well recognized to get rid of intestinal worms, ease constipation, and enhance digestion. Parijat seeds are especially effective in treating intestinal parasite infections. Its purifying qualities also aid in kidney and liver cleansing, which makes it a useful natural treatment for urinary tract infections and liver diseases.

In addition to its aesthetic value, Parijat flowers have therapeutic value. They aid in the natural relief of constipation and are moderate laxatives. Parijat flowers are also utilized in Ayurveda to balance the body's excess Pitta, which has a cooling effect and enhances general health. Since the plant's antibacterial and anti-inflammatory qualities aid in the treatment of skin conditions like eczema, rashes, and fungal infections, it is also frequently used in skincare products.

Many of these traditional use of parijat have been confirmed by contemporary scientific research, which also confirms the herb's analgesic, antioxidant, and antibacterial qualities. It is an important herb in Ayurvedic medicine because of its capacity to lower inflammation, combat infections, and enhance general health. With its many advantages, parijat is a crucial plant for holistic medicine, providing natural remedies for a range of illnesses and supporting the Ayurvedic idea of balancing the body's energy.

1.2.1 Pharmacognostical profile of parijat

Table 2: Pharmacognostical profile of parijat.

Scientific Name:-	Nyctanthes arbor-tristis
Common Names:-	Parijat, Harsingar, Night-flowering Jasmine
Family:-	Oleaceae
Genus:-	Nyctanthes
Species:-	arbor-tristis
Synonyms:-	Nyctanthes arbor-tristis Linn.

1.2.2 Properties of Parijat in Ayurveda

Table 3: Properties of Parijat in Ayurveda.

Taste	Bitter
Qualities	Light, Dry
Potency	Hot
Post-Digestive Effect	Pungent
Dosha Effect	Balances Vata and Kapha

1.2.3 Benefits of Parijat (*Nyctanthes arbor-tristis*) for Medicine

- Viral infections and fever
- Joint Pain and Arthritis
- Respiratory Conditions (Bronchitis, Cough, Asthma)
- Liver Protection and Digestive Health
- Advantages for Skin and Hair
- Booster for the Immune System
- Disorders of Stress, Anxiety, and Sleep

3. MATERIALS AND METHODS

3.1. Materials Used

The following materials were used in the preparation of Parijat Bhasma.

- Dried leaves/bark/flowers of Parijat (*Nyctanthes arbor-tristis*).
- Distilled water.
- Earthen crucibles (for incineration process).
- Iron or clay containers (for heating purposes).
- Traditional furnace or heating device.
- Wooden fuel or gas burner (as source of heat).
- Mortar and pestle (for powdering).

3.2. Identification of Plant

The plant *Nyctanthes arbor-tristis* (commonly known as Parijat) was authenticated by a recognized botanist from Forest Research Institute [FRI], based on its morphological and microscopic characteristics. A herbarium specimen was prepared and preserved for future reference.

3.3. Shodhana (Purification Process)

The leaves or bark of parijat are submerged in triphala decoction, cow urine, or other purifying liquids. heated over low heat for two to three hours at 40 to 60°C. aids in eliminating extra moisture and pollutants.

3.3.1. Dehydration: Elimination of Moisture

To preserve active ingredients, shade dry for two to three days at 30 to 40°C. High-moisture content materials can be dried in a dryer at 50–60°C.

3.3.2 Agni Tapan (Roasting): The Last Step in Purification

After purification, dried leaves or bark are roasted at 200-300°C for 1-2 hours in an open environment or mild fire. This burns organic impurities and prepares the material for bhasma formation.



Fig. 2: Roasting.

3.3.3. Chart of Temperature for the Shodhana Process

Table 4: Chart of Temperature for the Shodhana Process.

Process	Temperature(°C)	Duration
Steaming	40-50 °C	1-2 hours
Drying	30-60 °C	2-3 days
Heating	200-300 °C	1-2 hours

3.4. Marana (Process of Incineration)

3.4.1 Powdering (Churnakaran)

The purified and dried parts of the Parijat plant (mainly leaves and bark) were finely powdered using a mechanical grinder to obtain a smooth and even-textured powder.

3.4.2. Bhavana (Trituration with Liquid)

The fine powder was triturated with freshly prepared Parijat leaf juice until a uniform paste was formed. This step was continued for several hours to ensure proper absorption of the liquid into the powder.

3.4.3. Pellet Formation (Chakrika Nirman)

The paste was then shaped into small round pellets (chakrikas) and kept under sunlight for complete drying. The drying process ensured that no moisture remained in the pellets before incineration.

3.4.4. Sharava Samputa (Sealing in Earthen Pots)

The dried pellets were placed in an earthen crucible. Another pot was placed over it, and the joint was sealed using clay-smeared cloth (Kapad-Mitti). The sealed setup was allowed to dry naturally.

3.4.5. Puta Daan (Controlled Heating)

The sealed container was placed in a traditional Puta or electric muffle furnace. The system was subjected to controlled heating at approximately 600–700°C for a fixed duration (usually 3–4 hours). The heating facilitated complete combustion and transformation of the organic matter into ash.

3.4.6. Sheetkaran (Cooling Process)

After heating, the setup was left undisturbed for natural cooling. Once cooled completely, the container was carefully opened.

3.4.7. Collection of Bhasma

A fine, light, grayish-white ash was obtained, which was carefully collected, sieved, and stored in an airtight glass container.

3.5. Tests for Bhasma Standardization

3.5.1 Physical Tests

The Bhasma's consistency, texture, and appearance are evaluated using physical tests. These tests are necessary to make sure the Bhasma is free of coarse or gritty particles and has the proper shape.

3.5.1.1 Color

The Bhasma's color is investigated. A consistent grayish or white hue, signifying appropriate transformation, is the ideal Bhasma. Any discoloration could be an indication of contamination or an inadequate transformation.



Fig. 3: Color.

3.5.1.2 Texture

To assess the texture, make sure the Bhasma is finely powdered and free of coarse particles. It ought to feel silky to the touch.



Fig. 4: Texture of bhasma.

3.5.1.3. Weight

To verify the proper conversion of the source material and to guarantee consistency in the preparation, the Bhasma's weight is measured.



Fig. 5: Weight.

3.5.2. Chemical Tests

To assess the Bhasma's composition and purity, chemical tests are conducted. These tests verify that the Bhasma is devoid of dangerous contaminants and has the proper amounts of the therapeutic medicinal components.

3.5.2.1pH Test

To make sure the Bhasma is not overly acidic or alkaline, which could compromise its therapeutic qualities, its pH is checked. To guarantee accuracy, the solution was subsequently analyzed using a digital pH meter and pH paper. The measured pH value was found to be in the mildly alkaline range, usually between 7.5 and 8.5, suggesting that the bhasma is safe to use orally and does not have any acidic properties. This alkaline property supports the bhasma's historic use in treating inflammatory and digestive diseases and implies that it may aid in balancing the body's excess acidity.



Fig. 6: PH Test.

3.5.2.2. Microscopic Analysis

To ascertain whether the Bhasma is fine enough and bioavailable for the body to absorb, a microscopic analysis of its particle size and structure is performed. A small amount of Parijat Bhasma was mounted with glycerin on a sterile glass slide and examined under a compound microscope (10x and 40x objectives) to observe the distinctive plant cell structures and inorganic residues left over after incineration.

4. Mechanisms of Action of Bhasma

Numerous mechanisms contribute to Bhasma's efficacy in treating a range of illnesses: Absorption and Bioavailability: Bhasmas are readily absorbed by the body due to their high bioavailability. Bhasma is more potent than raw metals or herbs because of its thin, powdery nature, which enables the body to use it effectively. Dosha Balancing: The three basic energies (Pitta, Kapha, and Vata) that make up the body's doshas are balanced by bhasmas. Every Bhasma is ready to address a particular dosha imbalance, promoting harmony and enhancing general well-being. Detoxification: The detoxifying qualities of bhasmas aid in the body's removal of toxins, or ama. Bhasmas aid in the removal of these poisons from the body, which can lead to a number of health problems. Restoring Cellular Health: It is thought that certain Bhasmas, particularly ones crafted from metals like gold and silver, have restorative qualities that enhance general vitality and aid in cellular health restoration.

5. Safety Considerations in the Use of Bhasma

Although Bhasmas are frequently utilized in Ayurvedic treatments, their safety requires careful handling. It's crucial to take the following precautions when using Bhasmas: Appropriate Dosage: An expert Ayurvedic practitioner must carefully prescribe the dosage of Bhasma because overuse can result in toxicity or negative side effects. Characteristics

of the Bhasma: It is best to use only Bhasmas that have been properly produced and standardized. Poor quality or badly produced Bhasmas may be dangerous. Personal Aspects: Every person may respond to Bhasma in a unique way. Therefore, before utilizing Bhasma, it is crucial to have a tailored consultation with an Ayurvedic physician, particularly for people who already have health issues. Supervision: To guarantee safety and effectiveness, the use of Bhasmas should be overseen by a licensed Ayurvedic practitioner.

6. RESULT

Parijat Bhasma obtained was light brownish-white in color, soft, odorless, and tasteless. It successfully passed all classical tests like Varitaratva, Rekhapurnatva, Nirdhuma, and Apunarbhava. 267 g of dried Parijat powder was subjected to 3 putas, yielding 28.4g of bhasma in 6 days.

Table 5: Observation of shodhana.

Stage	Observation parameters	Details
Before shodhana	Appearance	Dark brown / grey color , presence of dust , stones, and organic matter
	Odour	Strong, unpleasant smell
	Texture	Coarse, slightly sticky or gritty
	Impurities	Visible stons impurities like soil particles and soil paticles and organic matter.
During Shodhana	Reaction with shodhana dravya	Effervescence observed, foam of bubble appeared
	Colour change	Gradual lightening of color
	Smell	Unpleasant odour reduced significantly
	Physical changes	Sedimentation of heavey particles, floating impurities removed
After Shodhana	Final appearance	Light-brown/ ash-like, clean and uniform
	Odour	Mild, characteristic of the purification medium (e. g., herbal?gomutra)
	Texture	Fine ,soft to touch, powdery
	Impurities	No visible impurities; completely purified material

Table 6: Observation Table for Putapaka Process.

Sr. No.	Heating Cycle (Putra)	Temperature (°C)	Weight Before (g)	Weight After (g)	Observation
1	First Putra	550°C	100g	95g	Slight charring, color change starts.
2	Second Putra	650 °C	87.4 g	83.5g	Brittle texture, partial ash formation
3	Third Putra	750 °C	66.3 g	61.7g	Powder formation increases, no luster.
4	Fourth Putra	850 °C	51.7g	47.5g	Fine ash-like texture, uniformity improves.
5	Fifth Putra	900 °C	34g	28.4g	Complete transformation into Bhasma

7. CONCLUSION

The preparation of Parijat Bhasma was carried out through a detailed and step-wise classical Ayurvedic method involving both Marana and Putapaka processes. Initially, the purified and dried parts of the Parijat plant were powdered and subjected to Bhavana with Parijat leaf juice, followed by Chakrika Nirman and sealing in Sharava Samputa. The sealed crucibles were incinerated in a controlled environment using an electric muffle furnace at approximately 650°C, ensuring complete transformation of the organic material into fine ash. After the Marana, the obtained ash underwent further refinement through the Putapaka process. In this phase, the ash was triturated sequentially with various herbal liquids such as Aloe vera juice, Triphala decoction, lemon juice, and cow urine, each selected for their unique therapeutic and detoxifying properties. The paste was reshaped into Chakrikas, sun-dried, and subjected to repeated heating cycles in sealed earthen crucibles. This process enhanced the therapeutic potential of the Bhasma while also ensuring stability and safety of the final product. The final Bhasma was a fine, soft, grayish-white ash, which

successfully passed all classical Ayurvedic Bhasma Pariksha parameters like Rekhapurna, Varitara, Nirdhuma, and Apunarbhava. The entire procedure confirmed that traditional methods, when carefully executed with scientific precision, can yield a standardized, potent, and pharmaceutically acceptable form of Parijat Bhasma suitable for therapeutic use.

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