## viii. Definition of puta, its types and use in various pharmaceutical forms

In Rasaśāstra (the Ayurvedic pharmaceutics branch specializing in mineral- and metal-based preparations), puṭa refers to a specific heating measure or protocol that regulates the intensity and duration of heat during the incineration (bhasmīkaraṇa) of metals, minerals, or other substances. Classical texts such as the Rasa Ratna Samuccaya (R.R.S.) and Śārṅgadhara Saṃhitā detail multiple types of puṭa—each defined by fuel quantity, pit size, or arrangement, ensuring optimal transformation and safety in bhasma or other forms.

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# **Definition of Puṭa and Its Rationale**

### 1. Etymology and General Concept

- "Puṭa" = a standardized heating measure used for calcining or subjecting materials (metals, minerals, shells, etc.) to controlled fire (agni).
- Ensures that raw materials achieve the desired chemical transformation (detoxification, fine incineration, homogeneous assimilation) without under-burning or overexposure.

#### 2. Classical References

- Rasa Ratna Samuccaya (R.R.S.) enumerates ~10 puṭas, while Śārṅgadhara mentions ~30 variants.
- Verse from R.R.S.:

**Translation:** "Puṭa indicates the correct measure of heat for processing mercury (*rasa*) and other substances. Over- or under-heating is undesirable; optimal heating ensures beneficial medicine."

# Types of Puṭa and Their Specifications

## Mahā Puta

### 1. Features

- **Dvi-hastha pramāṇa** (approx. 2 cubits in dimension, ~26 inches each side), requiring ~1,500 units of fuel (often *vanopala*, i.e., dried cow dung cakes or wood).
- Used for high-intensity incineration of **heavier metals** or refractory substances: *Abhraka (mica) bhasma* and *Lauha (iron) bhasma* typically demand such intense heat.

### 2 Use Cases

- Mica-based bhasmas requiring multiple repeated putas for complete sublimation/detoxification.
- Achieves temperatures suitable for **long, intense** calcination.

## Gaja Puţa

# 1. Dimension

- o Raja-hastha pramāṇa, ~22.5 inches on each side.
- Requires ~1,000 vanopala as fuel.

### 2. Applications

- o Typically for **Lauha, Abhraka, Tāmra** (copper), *Godantī, Śukti, Makṣika* bhasma, etc.
- o Provides robust but slightly lesser heat than Mahā puṭa, suitable for mid-range materials.

## Varāha Puţa (Kroda Puţa)

### 1. Dimension

- ~18 inches across (aratni pramāṇa).
- ∘ Fuel needed ~500 vanopala.

### 2. Target Substances

o Śaṅkha (conch), Śukti (pearl-oyster shell), Varāṭika (cowrie shells), Godantī, Śṛṅga (horn) for moderate

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incineration.

# Kapotha Puţa (Laghu Puţa or Small-scale)

### 1. Size & Fuel

- **No pit** or minimal pit; ~8 *vanopala* of fuel.
- o Lower-intensity heating for delicate substances.

### 2. Main Uses

• Rasa (mercury) bhasma, Ratna (gemstone) bhasma, or other easily fusible metals requiring gentler heat cycles.

## Kukkuţa Puţa

### 1. Dimension

○ **2 vithasthi** measure (~2–2.5 feet?), uses ~100 *vanopala* fuel.

#### 2. Substances

• For Swarna (gold), Rajata (silver), Tāmra (copper), Nāga (lead), Vaṅga (tin) incinerations, where moderate-low heat is enough.

## Gauvara / Gomaya Puţa

### 1. Fuel

- Principally **cow-dung** lumps arranged in a mound or pit.
- Used for Mercury (*Pārada*) bhasma or preliminary **Gandhaka (sulfur) jarana**.

## Bhūdhara Puţa

- 1. Shallow pit ~ 2 angula depth.
- 2. Typically for mild frying or heating steps, e.g., pre-processing certain herbs/minerals.

# Lavaka Puţa / Bhandāgāra Puţa

- Minimal fueling (1 pala cow-dung or husk).
- Used for delicate processes like partial heating of Mercury or Gandhaka jarana, ensuring no overexposure.

# **Usage in Various Pharmaceutical Forms**

## 1. Rasa-Bhasma Preparations

- o Kapotha puta: appropriate for certain quick-fusing metals or gem-based bhasmas.
- o Gorvara / Gomaya puṭa: central for mercury transformations (bhasma of pārada), or partial processing.

## 2. Bhasma from Metals (Fe, Cu, Sn, Pb)

- o Mahā puṭa or Gaja puṭa for Fe, Cu, or Mica incineration requiring high-temperature cycles.
- o Varāha puṭa for moderate metals/shells (śaṅkha, śukti).

### 3. Specialty Formulations

- Abhraka Bhasma: often demands repeated incineration with Mahā puţa or Gaja puţa to achieve a
  "sātvika" state (finest lamina).
- Gandhaka Jarana in Parada sometimes done in Bhanda puţa with minimal heat to fuse sulfur into mercury without denaturing.

# **Technical Aspects and Modern Adaptations**

# **Achieving Correct Temperature**

## 1. Fuel Quantification

- Vanopala is the classical measure (cow dung cakes or wood lumps). Modern labs standardize to kg-based measures or approximate calorific values.
- o E.g., 500 vanopala might approximate 50-70 kg of dung cakes (depending on dryness).

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## 2. Temperature Ranges

- Estimates: Gaja puţa can reach 700-800°C, Mahā puţa up to 900-1,000°C or more, depending on arrangement and insulation.
- Modern Rasaśāstra labs may use muffle furnaces with programmable ramp-up times, substituting the classical concept of puţa while retaining fundamental logic (time/heat cycles).

### **Documentation and Standardization**

### 1. Schedule T GMP

- Ayurvedic manufacturing must note incineration cycles, pit sizes or furnace settings, verifying uniform batch quality
- o Minimizing operator variability is crucial for safe bhasma outcomes, ensuring no free metals remain.

## 2. Analytical Validation

- Post-puţa bhasma tested via XRD (X-ray diffraction), SEM (scanning electron microscopy), or TEM (transmission electron microscopy) to confirm particle size, chemical composition.
- o Toxicological checks (heavy metal content, free metal presence) mandated to ensure consumer safety.

# **Practical Challenges and Future Directions**

## **Challenges**

## 1. Reproducibility

- Traditional puţa systems can be labor-intensive; minor changes in fuel dryness or pit insulation alter final temperatures.
- Muffle furnace usage must carefully replicate classical stepwise cycles for authenticity.

### 2. Scaling for Industry

- o Large-scale industrial setups can find it challenging to replicate Gaja or Mahā puţa exactly.
- Standard Operating Procedures (SOPs) bridging classical prescriptions with modern furnace calibrations are needed.

## 3. Skill Gaps

- Traditional Rasaśāstra knowledge (acharyas and PTS) must be transferred to new chemists/technicians for consistent practice.
- On-site training ensures correct layering of materials, ignition, and monitoring of color/smoke changes that denote key reaction phases.

## **Innovations**

## 1. Automated Furnaces

- Some labs simulate "puţa cycles" in programmable advanced kilns, replicating the slope of heating and cooling to match classical references.
- Sensors track real-time temperature across layers, ensuring uniform incineration.

## 2. Comparative Studies

- RCTs comparing *Swarna Bhasma* from "traditional Gaja puṭa" vs. "modern muffle furnace approach," analyzing absorption, safety, and clinical efficacy.
- $\circ \ \ \text{Potential synergy with Al-based analytics to optimize incineration steps for different metals or gem bhasma.}$

## **Path Forward**

- **Regulatory** bodies (Ministry of AYUSH) might define standard temperature/time benchmarks for major puṭas in official pharmacopeias (API).
- **Integration** with GMP ensuring traceable logs of each incineration batch, bridging classical authenticity and scientific reproducibility.
- **Educational** expansions in Rasaśāstra curriculum offering hands-on training in various puṭa types, calibrating them with modern instrumentation for global acceptance.

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# **Conclusion**

Puṭa—the incineration measure—lies at the heart of Rasaśāstra in Ayurveda, ensuring safe and efficacious transformation of metals, minerals, shells, and other materials into bhasma or specialized formulations. Textual authorities (Rasa Ratna Samuccaya, Śārṅgadhara) describe multiple puṭa from Mahā, Gaja, Varāha, Kapotha, etc., each prescribing dimension, fuel load, and specific usage.Modern labs interpret these guidelines with muffle furnaces, advanced instrumentation, and regulatory (GMP) compliance for quality control. By preserving classical logic of optimum heat while leveraging scientific tools (SEM, XRD, toxicological analyses), the puṭa tradition stands firmly integrated into contemporary Ayurvedic pharmaceutics—ensuring that age-old formulations like Abhraka bhasma, Swarna bhasma, or Loha bhasma remain potent, safe, and globally recognized.

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