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# PHARMACEUTICO-ANALYTICAL STUDY OF *BALAGODHUMADI KASHAYA*

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## ABSTRACT

**Aim:** To authenticate the raw materials, prepare *Balagodhumadi Kashaya* as per classical guidelines and establish its analytical profile through pharmacognostical, pharmaceutical, physicochemical, phytochemical, microbiological, heavy metal and HPTLC evaluations. **Methods:** All crude drugs were pharmacognostically identified according to API standards. The *Kashaya* was prepared following *Sharangadhara Saṃhita Kwatha Vidhi* using 90 g of raw drugs and 1,440 mL of water, reduced to one-eighth. Analytical parameters assessed included organoleptic features, pH, specific gravity, Brix value, total solids, microbial load, phytochemical constituents, heavy metals (ICP–OES) and HPTLC finger printing at 254 nm and 366 nm. **Results:** The prepared *Kashaya* exhibited pale brown colour, astringent–bitter taste and slightly viscous consistency. Physicochemical results were: pH **4.55**, specific gravity **1.00**, Brix value **1.88**, and total solids **1.96 % w/v**. Microbial analysis showed low bacterial (160 cfu/g) and fungal (40 cfu/g) counts, with complete absence of *E. coli*, *S. typhi*, *P. aeruginosa* and *S. aureus*. Phytochemical screening confirmed the presence of glycosides, flavonoids, phenols, tannins, saponins, alkaloids, steroids and terpenoids. Heavy metals—arsenic, cadmium, lead and mercury were within permissible limits. HPTLC analysis displayed **10 peaks at 254 nm** and **3 peaks at 366 nm**, establishing the fingerprint profile. **Conclusion:** *Balagodhumadi*

*Kashaya* prepared according to classical standards is authenticated, safe and analytically validated. Its rich phytochemical profile, acceptable physicochemical characteristics, low microbial load and compliant heavy metal levels confirm its quality and suitability for therapeutic use in cardiac disorders. The established HPTLC fingerprint further strengthens its standardization and supports future quality control studies.

**KEYWORDS**: *Balagodhumadi kashaya*, HPTLC, Brix value, Heavy metals, Phytochemical profile.

## INTRODUCTION

*Kashaya Kalpana* is one of the most fundamental and widely practiced dosage forms in *Ayurveda*. The process of preparing *Kashaya* helps extract water-soluble active principles and thermostable volatile constituents from crude drugs, ensuring rapid therapeutic action. Owing to its quick absorption and ease of digestion, *Kashaya Kalpana* plays a vital role in the management of acute and chronic ailments. In the context of *Hridroga* **(**cardiac disorders), *Kashaya* preparations hold special significance due to their ability to balance *Vata* and *Kapha doshas*, improve *Rasavaha and Raktavaha srotas* (circulatory channels) and enhance cardiac function by supporting *Hridaya marma.*

The *Balagodhumadi kashaya* described in A*rogyaklapadruma Hridroga prakarana*. *AarogyaKalpadruma*, also known as *Aarogya Raksha Kalpadruma*, is a classical Sanskrit text focused on Ayurvedic Pediatric care as practiced in Kerala.[1]

The text was authored by Kaikkulangara Rama Warrier, who originally composed the material in Malayalam, which was later translated into English and published in the Devanagari script.[2]

The *Kashaya* having 15 ingredients. Most of the ingredients in *Balagodhumadi Kashaya* have already been shown to possess cardioprotective properties. Notably, *Kola* (Ziziphus jujuba) is one of the key ingredients and is also included in *Charaka's Hridya Mahakashaya*[3]

Moreover, the use of *Prakṣepaka dravyas* such as *Saindhava, Sarpi* or *Madhu* allows for customization based on the dominant *dosha* involved in the disease. By altering the adjuvant accordingly, this formulation can effectively address dosha-specific cardiac conditions, whether they are *Vataja, Pittaja* or *Kaphaja Hridaya Rogas.*

## MATERIALS AND METHODS

### 1. Pharmacognostical Study

The raw drugs for *Balagodhumadi Kashaya* were collected from genuine, authenticated vendors and verified as per Ayurvedic Pharmacopoeia of India standards.[4] Each ingredient underwent macroscopic evaluation by observing colour, odour, taste, size, texture and surface features to confirm external authenticity, followed by microscopic examination of thin transverse sections stained with safranin and mounted in glycerine. Diagnostic characters such as vessels, fibres, trichomes, stone cells, starch grains, resin ducts and cork cells were identified under a compound microscope, ensuring correct botanical identity and detecting any adulteration or substitution. This combined macroscopic and microscopic pharmacognostical analysis confirmed the purity and authenticity of the raw drugs used, ensuring the quality, efficacy and reproducibility of *Balagodhumadi Kashaya.*

**Table 1: Ingredients of the *Balagodhumadi Kashaya.***

| | Drugs | Parts used | Botanical name | Part |
|---|---|---|---|---|
| 1. | *Brihathi* | Root | *Solanum indicum* | 1 Part |
| 2. | *Kantakari* | Root | *Solanum xanthocarpum* | 1 Part |
| 3. | *Saliparni* | Root | *Psuedatria viscida* | 1 Part |
| 4. | *Prishniparni* | Root | *Desmodium gangeticum* | 1 Part |
| 5. | *Gokshura* | Root | *Tribulus terrestris* | 1 Part |
| 6. | *Bala* | Root | *Sida cordifolia* | 1 Part |
| 7. | *Godhuma* | Fruit | *Triticum aestivum* | 1 Part |
| 8. | *Vilwa* | Root | *Aegle marmelos* | 1 Part |
| 9. | *Angnimantha* | Root | *Premna integrifolia* | 1 Part |
| 10. | *Eranda* | Root | *Ricinus communis* | 1 Part |
| 11. | *Punarnava* | Root | *Boerhavia diffusa* | 1 Part |
| 12. | *Yava* | Fruit | *Hordeum vulgare* | 1 Part |
| 13. | *Kola* | Fruit | *Ziziphus jujube* | 1 Part |
| 14. | *Devadaru* | Root | *Cedrus deodara* | 1 Part |
| 15. | *Kulatha* | Fruit | *Dolichos biflorus* | 1 Part |

### 2. Pharmaceutical study

The pharmaceutical study was carried out strictly according to the *Kashaya Kalpana* principles described in *Sharangadhara Saṃhita, Madhyama Khanda*. All raw drugs were procured from authenticated vendors, cleaned thoroughly to remove dust and foreign matter and the dried plant materials were chopped into small pieces for efficient extraction. Cereals and legumes such as *Yava, Godhuma,* and *Kulatha* were dehusked, washed, shade-dried and stored separately in airtight, labelled containers to avoid moisture exposure and cross-contamination. For the preparation of *Balagodhumadi Kashaya,* a total of 90 g of coarsely

powdered raw drugs (6 g each of 15 ingredients) was taken in a clean stainless-steel vessel, to which 180 ml distilled water was added and marked the level, to this remaining 1260mL of distilled water was added, maintaining the classical proportion of 1:16 (drug:water). The mixture was boiled on mild fire with continuous stirring to prevent charring and reduced to one-eighth of the total volume (about 180 mL) as per the level marked before heating. Once the required reduction was reached, the decoction was filtered through clean muslin cloth to obtain a clear filtrate and stored in a sterile, airtight container for further analytical evaluation. All procedures were performed under hygienic conditions using standard laboratory equipment to ensure accuracy, reproducibility and adherence to classical Ayurvedic pharmaceutical standards.

## 3. Analytical Study

### A) Oranoleptic characters

- Colour
- Taste
- Odour
- consistency.

### B) Physico chemical parameters[5],[6]

1. PH
2. Specific gravity
3. Brix value
4. total solids (% w/v)

### C) Microbiology analysis[7]

### D) Test for specific pathogens[8]

### E) HPTLC[9]

### F) ICP –OES -tests for heavy metals[10],[11]

**G) Test for phytoconstituents:** Tests for Glycosides,Terpenoids, Flavonoids Tannins, Steroids,saponins, Alkaloids& Phenols.[12]

**Table 2: the Tests for Phytoconstituents.[13]**

| Phytoconstituent | Test & Procedure | Inference |
|---|---|---|
| Glycosides [14] | Alcoholic extract + water + few drops NaOH. Observe colour. | Yellow colour → Glycosides present. |
| Terpenoids | Chloroform extract + conc. $H_2SO_4$ added along tube wall. | Red coloration in chloroform layer. |
| Flavonoids | Extract + 2% NaOH → yellow, then add dil. HCl. | Yellow turns colourless after HCl. |
| Tannins / Phenols | Extract + $FeCl_3$ solution. | Blue/green colour formation. |
| Steroids | Chloroform extract + conc. $H_2SO_4$ (Salkowski). | Red ring at interface; greenish lower layer. |
| Saponins | Extract shaken vigorously in test tube. | Persistent stable foam. |
| Alkaloids | Extract + Wagner's reagent. | Reddish-brown precipitate. |

## RESULTS

The raw drugs of the Balagodhumadi Kashayam are evaluated both macroscopically and microscopically.

### 1. Pharmaceutical study

The preparation of Balagodhumadi Kashayam took approximately 1hr 05 minutes.

### 2. Analytical study

### A) Organoleptic Characters

- Color: Pale brown
- Taste: Astringent to bitter
- Odour: characteristic smell
- Consistency: Thicker than water.

### B) Physico Chemical Features

- pH :4.55
- Specific gravity: 1.00
- Brix value: 1.88
- Total solids (% w/v) :1.96

### C) Microbiology analysis

- Total bacterial count: 160 (cfu/g)
- Total yeast and mould count: 40 (cfu/g).

**D) Test for specific pathogens**

- *Escherichia coli: Absent*
- *Salmonella typhi: Absent*
- *Pseudomonas aeruginos : Absent*
- *Staphylococcus aureus: Absent*

**E) Tests for phytoconstituents**

Glycosides, Terpenoids, Flavonoids Tannins, Steroids, saponins, Alkaloids& Phenols were present.

**F) ICP –OES – heavy metals**

A. Arsenic- nil

B. Cadmium- 0.05

C. Lead- 0.36

D. Mercury- 0.13

**G) HPTLC**

**Overview graph of *balagodhumadi Kashaya* sample at 254nm**

Total peak no – 10

Total area – 22045.3 (au).

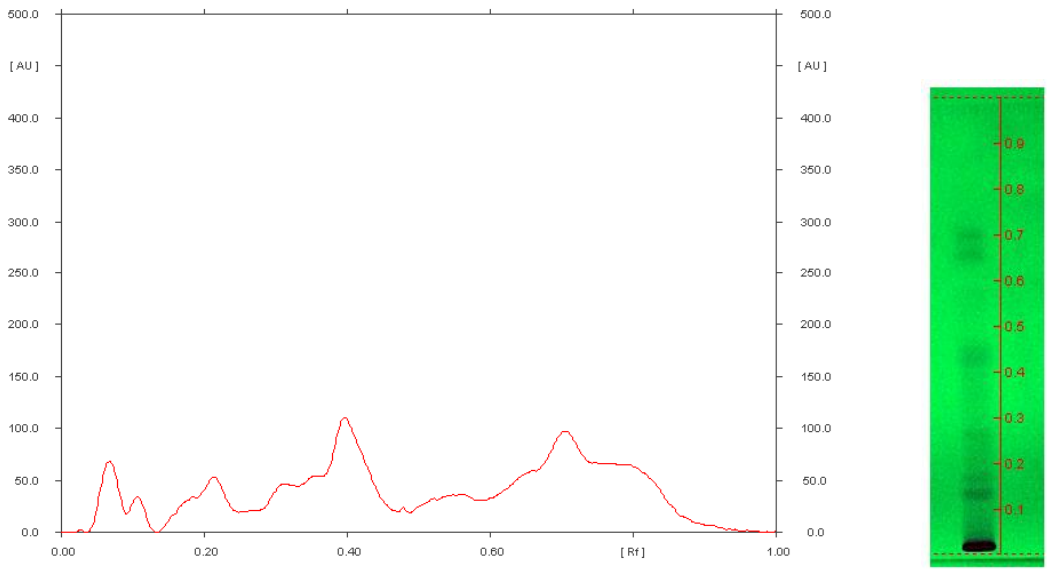


**Figure 1: Overview graph of balagodhumadi kashaya sample at 254 nm.**

**Overview graph of balagodhumadi kashaya sample at 366nm**

Total peak no – 03

Total area – 1567.9 (au).

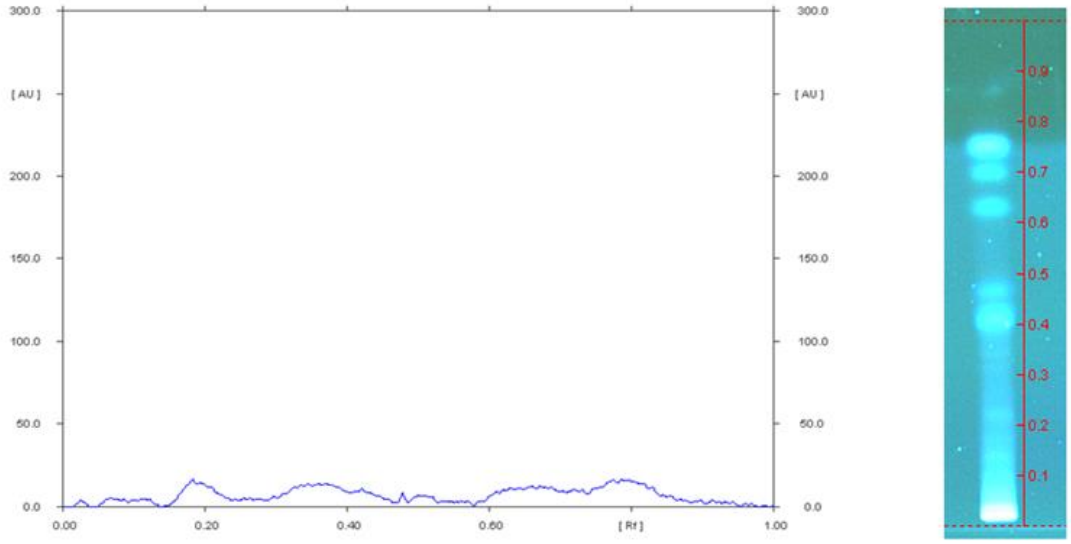


**Figure 2: Overview graph of balagodhumadi kashaya sample at 366 nm.**

## DISCUSSION

The preparation and evaluation of *Balagodhumadi Kashaya* were carried out with rigorous adherence to classical Ayurvedic principles and modern analytical standards to ensure authenticity, safety and therapeutic reliability. All raw drugs were procured from reliable suppliers and underwent systematic pharmacognostical authentication following the standards of the *Ayurvedic Pharmacopoeia of India*. This ensured the correct botanical identity, purity and absence of adulteration, which is essential for maintaining the therapeutic efficacy of herbal formulations.

The *Kashaya* preparation strictly followed the *Kwatha Vidhi* described in *Sharngadhara Saṃhita (Madhyama Khanda)*. The decoction was prepared over a mild flame to facilitate uniform extraction without degrading heat-sensitive constituents. The total preparation time was around 65 minutes, allowing optimal extraction of phytochemicals. Careful stirring prevented charring and ensured proper reduction to one-eighth of the initial volume. After filtration through muslin cloth, the decoction displayed clarity and uniformity. Samples for microbiological and analytical evaluations were collected in sterile containers and transported immediately to avoid deterioration or contamination. These controlled procedures significantly contributed to the reliability and reproducibility of the formulation.

Organoleptic evaluation revealed that *Balagodhumadi Kashaya* possessed characteristic features expected of a classical decoction. Its pale brown colour indicated adequate extraction of tannins and polyphenols. The astringent-bitter taste corresponded to the natural rasa of its ingredients. A slightly viscous consistency suggested the presence of soluble extractives, while the characteristic odour confirmed freshness and absence of spoilage.[15] Such sensory attributes reflect proper preparation quality and serve as preliminary markers for standardization.[16] The physicochemical findings further reinforced the quality of the formulation. The pH was mildly acidic (4.55), promoting stability and discouraging microbial growth. The specific gravity of 1.00 indicated correct concentration. A Brix value of 1.88 reflected appropriate levels of dissolved solids including tannins, sugars and phytochemicals. The total solids content of 1.96% w/v confirmed efficient extraction and adequate strength of the decoction. Together, these parameters demonstrate that the Kashaya was prepared under optimal conditions that support its therapeutic efficiency and consistency in future batches.[17] Microbiological evaluation showed very low bacterial (160 cfu/g) and fungal (40 cfu/g) counts, both within permissible limits for Ayurvedic preparations. The absence of pathogens *Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* confirmed that the *Kashaya* was prepared and handled under hygienic conditions, making it safe for internal use. Maintaining low microbial load is essential in herbal decoctions as contamination can compromise efficacy and safety.[18]

Preliminary phytochemical screening indicated the presence of glycosides, terpenoids, flavonoids, tannins, alkaloids, saponins, steroids, and phenols. These bioactive compounds collectively contribute to the formulation's therapeutic role in *Hridroga* (cardiac disorders).[19] Flavonoids and phenols impart antioxidant and cardioprotective effects, tannins provide astringent and anti-inflammatory actions, while saponins and glycosides support cardiac tone and circulation.[20]

The presence of such diverse secondary metabolites highlights the pharmacological richness of the formulation and validates its traditional indications.

Assessment of heavy metals (ICP–OES) confirmed that arsenic was not detected, and cadmium (0.05 ppm), lead (0.36 ppm), and mercury (0.13 ppm) were within permissible limits. This ensures the formulation's safety, as heavy metal contamination poses serious health risks.

HPTLC fingerprinting generated chromatograms with 10 peaks at 254 nm and 3 peaks at 366 nm, reflecting the presence of multiple UV-absorbing and fluorescent phytoconstituents. These chromatographic profiles serve as reliable markers for future standardization, authenticity verification, and batch-to-batch consistency.[21]

Overall, the comprehensive analytical evaluation establishes that B*alagodhumadi Kashaya* is a safe, standardized and pharmacologically potent formulation. It meets both classical Ayurvedic standards and contemporary quality control parameters, supporting its suitability for therapeutic application in cardiac disorders.

## CONCLUSION

The present study confirms that *Balagodhumadi Kashaya*, when prepared in accordance with classical Ayurvedic principles and evaluated using modern analytical techniques, fulfills essential criteria of authenticity, safety, and quality. Organoleptic, physicochemical, microbiological, phytochemical, heavy metal, and HPTLC analyses collectively demonstrated optimal preparation, absence of contamination, and the presence of therapeutically relevant bioactive constituents. The established analytical profiles provide reliable reference parameters for standardization and batch-to-batch consistency. Overall, the findings scientifically validate the traditional use of Balagodhumadi Kashaya in *Hridroga* and support its safe and effective application in clinical practice.

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