

## ANALYTICAL EVALUATION OF *HINGVADI CHOORNA*: AN AYURVEDIC POLYHERBAL FORMULATION

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### ABSTRACT

**Background:** *Hingvadi Choorana* is a classical ayurvedic polyherbal formulation described in *Yogaratanakara*. Although the formulation is documented in classical literature, comprehensive analytical evaluation is limited. Establishing its analytical profile is essential for scientific documentation and quality evaluation. **Aim:** To prepare *Hingvadi Choorana* according to classical ayurvedic procedures and evaluate its organoleptic, physicochemical, phytochemical, HPTLC fingerprint, and elemental characteristics. **Materials and Methods:** Raw materials were authenticated, processed where applicable, and used for the preparation of *Hingvadi Choorana* as per the classical reference. The prepared formulation was evaluated for its organoleptic characteristics, physicochemical parameters, qualitative and quantitative phytochemical constituents, HPTLC fingerprint profile, and elemental composition using standard analytical methods. **Results:** The

formulation exhibited characteristic organoleptic properties and acceptable physicochemical characteristics. Phytochemical analysis demonstrated the presence of major secondary metabolites, while HPTLC fingerprint profiling revealed distinct chromatographic peaks at 254 nm and 366 nm, indicating a chemically diverse phytoconstituent profile. Elemental analysis identified the presence of essential macro- and microelements, contributing to the overall elemental composition of the formulation. **Conclusion:** The present study provides a

comprehensive analytical profile of *Hingvadi Choorna* through physicochemical, phytochemical, chromatographic, and elemental evaluation. The generated data contribute to the quality evaluation and chemical characterization of the formulation and may serve as a useful reference for future analytical investigations.

**KEYWORDS:** *Hingvadi Choorna*, Physicochemical analysis, Phytochemical analysis, High-performance thin-layer chromatography (HPTLC), Elemental analysis.

## INTRODUCTION

*Ayurveda*, one of the oldest traditional systems of medicine, has been practiced for centuries for the prevention and management of diseases using herbal and herbo-mineral formulations. The increasing global acceptance of herbal medicines has emphasized the need to ensure their quality, safety, and consistency through scientific evaluation. Authentication of raw materials, appropriate pharmaceutical processing, and analytical characterization are essential for maintaining the identity, purity, and quality of ayurvedic formulations.<sup>[1]</sup>

*Hingvadi Choorna* is a classical polyherbal formulation described in *Yogaratanakara*. It comprises *Hingu* (*Ferula foetida*), *Haritaki* (*Terminalia chebula*), *Kushta* (*Saussurea lappa*), *Vacha* (*Acorus calamus*), *Shunti* (*Zingiber officinale*), *Pushkaramoola* (*Inula racemosa*), *Pippali* (*Piper longum*), *Chitraka* (*Plumbago zeylanica*), *Souvarchala Lavana*, *Vida Lavana*, and *Yavakshara*. The formulation is indicated in the management of *Hridroga* and *Śūla*, with *Yavakwātha* prescribed as the *Anupāna*.<sup>[2]</sup>

Scientific quality evaluation of ayurvedic formulations involves authentication of raw drugs, physicochemical analysis, phytochemical screening, and advanced analytical techniques, which collectively contribute to the quality evaluation and chemical characterization of the formulation.<sup>[1]</sup> High-Performance Thin-Layer Chromatography (HPTLC) provides characteristic chemical fingerprints that facilitate the standardization and quality control of herbal formulations.<sup>[3]</sup> *Hingvadi Choorna* is a classical ayurvedic formulation described in the literature; however, comprehensive scientific reports describing its physicochemical, phytochemical, and analytical characteristics remain limited. Therefore, analytical evaluation is essential for establishing the quality characteristics of the formulation.

Hence, the present study was undertaken to prepare *Hingvadi Choorna* according to classical ayurvedic procedures and to establish its analytical profile through organoleptic, physicochemical, phytochemical, HPTLC, and elemental analyses.

## MATERIALS AND METHODS

### Collection and Authentication of Raw Materials

The raw materials required for the preparation of *Hingvadi Choorna* were procured from authenticated ayurvedic drug suppliers. *Pushkaramoola* was obtained from Himachal Pradesh through a pharmaceutical supplier. *Yavakshara* was procured from Manikarnika Shop, Pune, Maharashtra. *Haritaki*, *Shunti*, *Vacha*, *Hingu*, *Pippali*, and *Kushta* were purchased from Manjunath Ayurveda Drug Store, Payyanur, Kannur, while *Chitraka*, *Souvarchala Lavana*, and *Vida Lavana* were procured from Shanthi Ayurveda Pharmacy, Taliparamba, Kannur. Authentication of the collected drugs was carried out in accordance with API standards.

## STUDY SETTING

### 1. Authentication of Raw Materials

- Herbal drugs – Department of Dravyaguna Vijnana, Government Ayurveda College, Kannur, as per API.
- Mineral drugs – Department of Rasashastra and Bhaishajya Kalpana, Government Ayurveda College, Kannur, and Sophisticated Test and Instrumentation Centre (STIC), Cochin University of Science and Technology (CUSAT), Kochi, as per API.

### 2. Pharmaceutical Study

- Department of Rasashastra and Bhaishajya Kalpana, Government Ayurveda College, Kannur.

### 3. Physicochemical and HPTLC Analysis

- Arya Vaidya Sala, Kottakkal.

### 4. Phytochemical Analysis

- Center for Research on Molecular and Applied Sciences Pvt Ltd, CRMAS, DRNRA41, Devi Nagar, Valiyavila, Thirumala P.O, Thiruvananthapuram.

### 5. Elemental Analysis

- Sophisticated Test and Instrumentation Centre (STIC), Cochin University of Science and Technology (CUSAT), Kochi.

## PHARMACEUTICAL STUDY

### Prerequisite procedure

#### 1. Removal of physical impurities

The raw drugs were cleaned to remove foreign matter and other physical impurities. The cleaned materials were dried wherever necessary and stored separately in airtight containers until further processing.

#### 2. Purification of raw drugs

The raw drugs requiring purification were subjected to *Sodhana* according to classical ayurvedic procedures prior to formulation.

##### a) *Sodhana* of *Chitraka*

*Chitraka* (*Plumbago zeylanica* L.) was purified according to the procedure described in *Rasa Tarangini*. *Choornodaka* was prepared by allowing 12 g of lime powder to settle in 3 L of water for approximately 9 hrs, and the clear supernatant was used. 100 grams of cleaned *Chitraka* root pieces were repeatedly soaked in the freshly prepared *Choornodaka*, replacing the medium whenever a pink colour developed until no further colour change was observed. The purified roots were then separated, dried, and pulverized into a fine powder for use in the preparation of *Hingvadi Choorna*.<sup>[4]</sup>



**Fig-1. Chitraka Mula**



**Fig-2. Choornodaka.**



**Fig-3. Chitraka Mula immersed in choornodaka.**



**Fig-4. Washing of Chitraka Mula.**



**Fig-5. Drying of washed Chitraka Mula.**

### b) Sodhana of Hingu

*Hingu* was purified according to the procedure described in *Rasamrita*.<sup>[5]</sup> 50g of crude *Hingu* was broken into small pieces and subjected to *Bharjana* (roasting) in a small quantity of *Goghrita* over gentle heat until it became crisp and attained a dark brown colour. The processed material was allowed to cool, dried, and stored in an airtight container until further use.



**Fig-6. Crude Hingu   Fig-7. Bharjana of Hingu   Fig-8. Shuddha Hingu**

### c) Sodhana of Pippali

*Pippali* was purified by *Bharjana* in *Goghrita* over mild heat until it became crisp and dark brown. The purified drug was allowed to cool before further processing.



**Fig-9. Bharjana of Pippali   Fig-10. Pippali after Bharjana**

### Preparation of Hingvadi Choorna

**Table 1: Ingredients and quantity for preparation of Hingvadi Choorna.**

| Sl no | Name of Drug         | Botanical name             | Part used      | Ratio  |
|-------|----------------------|----------------------------|----------------|--------|
| 1     | <i>Hingu</i>         | <i>Ferula foetida</i>      | Oleo gum resin | 1 part |
| 2     | <i>Vacha</i>         | <i>Acorus calamus</i>      | Rhizome        | 1 part |
| 3     | <i>Shunti</i>        | <i>Zingiber officinale</i> | Rhizome        | 1 part |
| 4     | <i>Pippali</i>       | <i>Piper longum</i>        | Fruit          | 1 part |
| 5     | <i>Kushta</i>        | <i>Saussurea lappa</i>     | Root           | 1 part |
| 6     | <i>Haritaki</i>      | <i>Terminalia chebula</i>  | Fruit          | 1 part |
| 7     | <i>Chitraka</i>      | <i>Plumbago zeylanica</i>  | Root           | 1 part |
| 8     | <i>Pushkaramoola</i> | <i>Inula racemosa</i>      | Root           | 1 part |

|    |                           |                            |   |        |
|----|---------------------------|----------------------------|---|--------|
| 9  | <i>Yavakshara</i>         | <i>Potassium carbonate</i> | - | 1 part |
| 10 | <i>Souvarchala lavana</i> | -                          | - | 1 part |
| 11 | <i>Vida lavana</i>        | -                          | - | 1 part |

### Images of Ingredients

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |
| <b>Fig-11. Hingu</b>                                                                | <b>Fig-12. Vacha</b>                                                                | <b>Fig-13. Shunti</b>                                                                 |
|   |   |   |
| <b>Fig-14. Pippali</b>                                                              | <b>Fig-15. Kushta</b>                                                               | <b>Fig-16. Haritaki</b>                                                               |
|  |  |  |
| <b>Fig-17. Chitraka</b>                                                             | <b>Fig-18. Pushkaramoola</b>                                                        | <b>Fig-19. Vida lavana</b>                                                            |
|  |  |                                                                                       |
| <b>Fig-20. Souvarchala lavana</b>                                                   | <b>Fig-21. Yavakshara</b>                                                           |                                                                                       |

### Method of Preparation

*Hingvadi Choorna* was prepared according to the method described in *Sharangadhara Samhita*.<sup>[6]</sup> The 7 herbal ingredients (*Vacha*, *Shunti*, *Pippali*, *Chitraka*, *Pushkaramoola*,

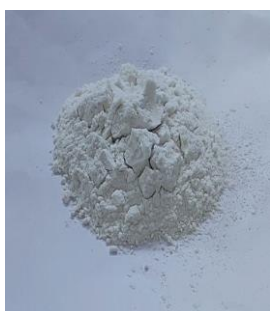
*Haritaki, Kushta*) were thoroughly cleaned and dried completely before use. *Sodhana* was performed for *Hingu* and *Chitraka* according to the respective classical references while *Pippali* was roasted in *Goghrita*. *Souvarchala Lavana* and *Vida Lavana* were gently heated to remove residual moisture before pulverization. 30 grams of each ingredient were weighed according to the prescribed proportion. All the ingredients, except *Yavakshara*, were powdered separately, passed through sieve No. 85 to obtain uniform particle size, and blended with *Yavakshara* to obtain a homogeneous formulation. A total of 330 g of *Hingvadi Choorna* was prepared and stored in airtight containers until further analysis.



**Fig. 22: Sieve no: 85.**



**Fig. 23: Eight herbal ingredients.**



**Fig-24. Vida lavana.**



**Fig-25. Souvarchala lavana.**



**Fig-26. Yavakshara.**



**Fig-27. Mixing of all ingredients.**



**Fig-28. Hingvadi Choorna.**

## RESULTS

### 1) Organoleptic evaluation

The organoleptic characteristics of *Hingvadi Choorna*, including colour, odour, taste, and texture, were evaluated, and the observations are presented in Table 2.

**Table 2: Organoleptic properties of *Hingvadi Choorna*.**

|             |                      |
|-------------|----------------------|
| Colour      | Pale brown           |
| Odour       | Characteristic smell |
| Taste       | <i>Katu Thikta</i>   |
| Consistency | Fine powder          |

### 2) Physicochemical parameters

Physicochemical evaluation of *Hingvadi Choorna* was carried out to determine quality control parameters such as loss on drying, ash values, and extractive values. The results are presented in Table 3.

**Table 3: Result of Physicochemical parameters of *Hingvadi Choorna*.**

| Test parameter             | Result      |
|----------------------------|-------------|
| Loss on Drying             | 8.27 % w/w  |
| pH                         | 7.30        |
| Total Ash                  | 29.43 % w/w |
| Acid insoluble Ash         | 2.56 % w/w  |
| Water soluble Extractive   | 51.27 % w/w |
| Alcohol soluble Extractive | 13.14 % w/w |

### 3) Phytochemical evaluation

Qualitative and quantitative phytochemical analyses of *Hingvadi Choorna* were carried out to identify and estimate the major phytoconstituents present in the formulation. The results are presented in Tables 4 and 5.

**Table 4: Results of Qualitative Phytochemical analysis of *Hingvadi Choorna*.**

| TEST          | OBSERVATION                                | INFERENCE                    |
|---------------|--------------------------------------------|------------------------------|
| 1. ALKALOIDS  | Reddish-orange colour was not observed     | Absence of Alkaloids (-)     |
| 2. FLAVONOIDS | Dirty brown colour was observed            | Presence of flavonoids (+++) |
| 3. PHENOLS    | Green colour was not observed              | Absence of Phenols (-)       |
| 4. GLYCOSIDES | Yellowish colour was not observed          | Absence of Glycosides(-)     |
| 5. SAPONINS   | Honeycomb-like foam was not observed       | Absence of Saponins (-)      |
| 6. STEROIDS   | Reddish-brown ring was not observed        | Absence of Steroids (-)      |
| 7. TANNINS    | Disappearance of black colour was observed | Presence of Tannins (++)     |
| 8. TERPENOIDS | Reddish brown ring was not observed        | Absence of Terpenoids (-)    |

**Table 5: Result of Quantitative Phytochemical analysis of *Hingvadi Choorna*.**

| Test       | Amount of phytochemicals per mg of sample |
|------------|-------------------------------------------|
| TERPENOIDs | 0.165                                     |
| FLAVONOIDs | 0.6420                                    |
| ALKALOIDs  | 0.3764                                    |
| PHENOLs    | 0.39182                                   |

**4) Elemental analysis**

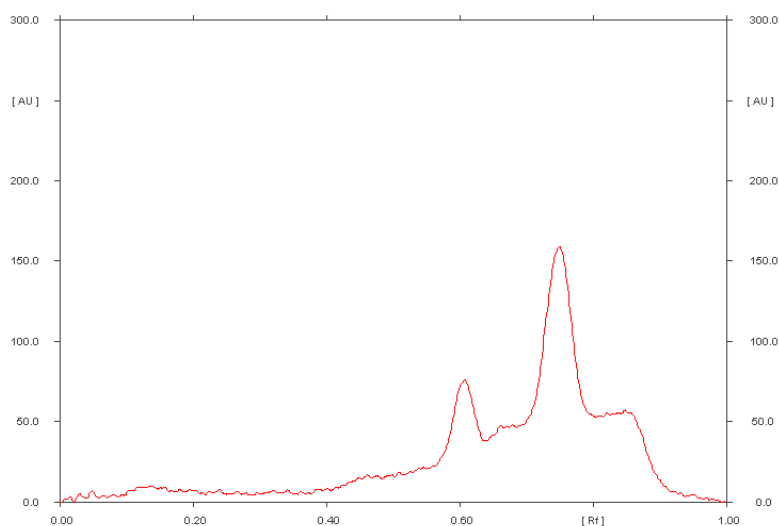
ICP-MS analysis was performed to determine the elemental composition of *Hingvadi Choorna*. The concentrations of the detected elements are summarized in Table 6.

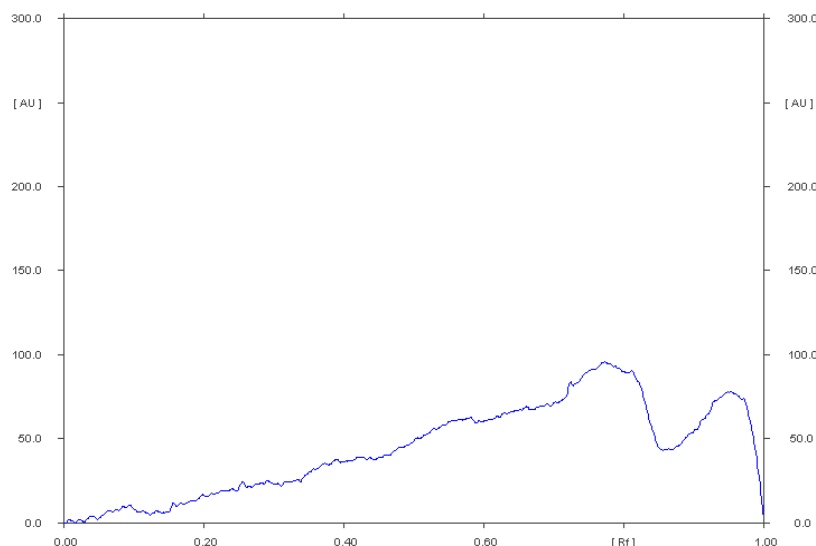
**Table 6: ICP MS Elemental analysis.**

|           |        |
|-----------|--------|
| Magnesium | 0.38 % |
| Calcium   | 0.15%  |
| Iron      | 0.12%  |
| Manganese | 42.50% |
| Copper    | 12.67% |
| Zinc      | 25.57% |
| Selenium  | BDL    |
| Sodium    | 5.97%  |
| Pottasium | 4.57%  |

**5) HPTLC study**

Densitometric analysis of *Hingvadi Choorna* was carried out at 254 nm and 366 nm to establish its chromatographic fingerprint profile. Three peaks were observed at 254 nm and four peaks at 366 nm. The chromatograms, HPTLC plate images, and the corresponding R<sub>f</sub> values with peak areas are presented below.

**Graph 1: Overview graph of *Hingvadi Choorna* sample at 254 nm.**



Graph 2: Overview graph of *Hingvadi Choorna* sample at 366 nm.

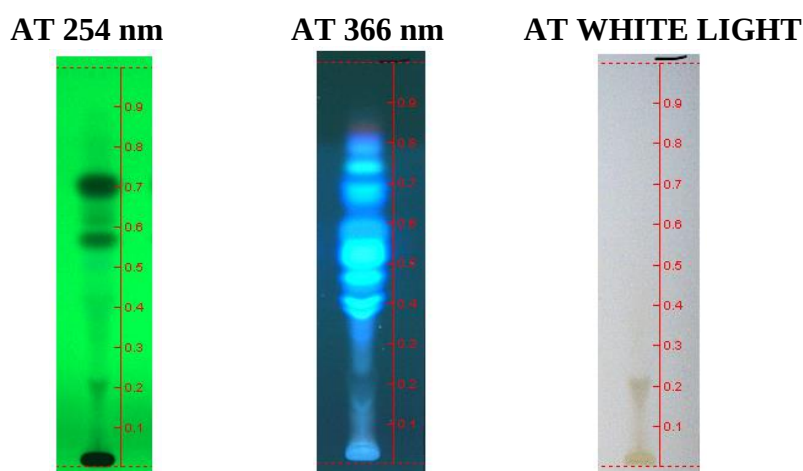


Fig-29. TLC plate of *Hingvadi Choorna* sample.

Table 7: Rf value & % area of *Hingvadi Choorna* sample at 254 nm.

| Peak no | Rf value | Area (AU) | % Area (AU) |
|---------|----------|-----------|-------------|
| 1       | 0.61     | 3418.7    | 22.87       |
| 2       | 0.75     | 8879.0    | 59.39       |
| 3       | 0.85     | 2653.8    | 17.74       |

TOTAL PEAK NO- 03

TOTAL AREA – 14951.5 (AU)

Table 8: Rf value & % area of *Hingvadi Choorna* sample at 366 nm.

| Peak no | Rf value | Area (AU) | % Area (AU) |
|---------|----------|-----------|-------------|
| 1       | 0.23     | 822.0     | 5.83        |
| 2       | 0.56     | 4524.7    | 32.11       |
| 3       | 0.60     | 629.7     | 4.47        |
| 4       | 0.77     | 8114.5    | 57.59       |

TOTAL PEAK NO – 04

TOTAL AREA – 14090.9 (AU)

## DISCUSSION

### Organoleptic evaluation

The organoleptic characteristics of *Hingvadi Choorna*, including its pale brown colour, characteristic odour, fine powder consistency, and *Katu-Tikta* taste, were consistent with the characteristics of its constituent ingredients and indicated appropriate pharmaceutical processing. The fine powdered form facilitates uniform mixing of the ingredients and enhances the extraction of phytoconstituents.

### Physicochemical evaluation

The physicochemical parameters obtained in the present study provide valuable information regarding the quality characteristics of the formulation. The loss on drying value indicated a moderate moisture content, suggesting adequate drying with minimal residual moisture, which is favourable for maintaining product stability during storage. The near-neutral pH indicates favourable physicochemical properties of the formulation. The total ash value reflects the overall inorganic content contributed by the herbal and mineral-derived components, while the comparatively low acid-insoluble ash value suggests minimal contamination with siliceous matter such as sand or soil, indicating appropriate handling and processing during formulation.

The water-soluble extractive value was considerably higher than the alcohol-soluble extractive value, indicating that a larger proportion of the constituents is water-soluble. This finding suggests that a substantial proportion of the phytoconstituents present in *Hingvadi Choorna* are hydrophilic in nature and are readily extractable in water. The alcohol-soluble extractive value, although lower, indicates the presence of moderately polar constituents that also contribute to the overall chemical profile of the formulation. Collectively, these physicochemical findings provide baseline analytical data for the quality evaluation of *Hingvadi Choorna*.

### Phytochemical analysis

Qualitative phytochemical screening demonstrated the presence of flavonoids and tannins, while quantitative estimation confirmed the presence of flavonoids, phenolics, alkaloids, and terpenoids in varying amounts. These phytochemical groups are well-recognized secondary

metabolites of medicinal plants and contribute significantly to the chemical composition and biological properties of herbal formulations. The predominance of flavonoids observed in the present study, together with the detection of phenolic compounds, tannins, alkaloids, and terpenoids, reflects the complex phytochemical composition of *Hingvadi Choorna*. These findings contribute to the chemical characterization of the formulation and provide analytical evidence supporting its quality evaluation.

### HPTLC Fingerprint Profiling

HPTLC fingerprint profiling further supported the analytical characterization of *Hingvadi Choorna* by generating a characteristic chromatographic pattern. Densitometric analysis at 254 nm and 366 nm revealed three and four peaks, respectively, with distinct R<sub>f</sub> values, indicating the presence of several chemically diverse constituents in the formulation. The variation in chromatographic profiles observed at the two wavelengths reflects the detection of different classes of phytoconstituents, as compounds exhibit different absorption and fluorescence characteristics under ultraviolet light. The prominent peaks observed at both wavelengths represent major constituents of the formulation, whereas the remaining peaks correspond to comparatively minor components. Although the individual compounds represented by these peaks were not identified in the present study, the fingerprint profile provides a characteristic analytical identity for *Hingvadi Choorna*. Such chromatographic fingerprints are valuable for the chemical characterization and quality evaluation of the formulation and may serve as a reference for future analytical investigations.

### Elemental Analysis

Elemental analysis demonstrated the presence of essential macroelements and microelements, including calcium, magnesium, iron, manganese, copper, zinc, sodium, and potassium. These elements are naturally present in herbal and mineral ingredients and may contribute to the overall elemental composition of the formulation. Calcium and magnesium are important physiological minerals, whereas iron, zinc, copper, and manganese are essential trace elements involved in numerous enzymatic and metabolic processes. The elemental profile obtained in the present study complements the analytical characterization of *Hingvadi Choorna* and contributes to its quality evaluation. These findings further highlight the value of elemental profiling as an integral component of the comprehensive analytical evaluation of ayurvedic formulations.

## CONCLUSION

The present study established the physicochemical, phytochemical, chromatographic, and elemental characteristics of *Hingvadi Choorna* through comprehensive analytical evaluation. The findings provide valuable information on the quality characteristics and chemical profile of the formulation. The analytical findings generated in this study may serve as a useful reference for the quality evaluation and future analytical investigations of *Hingvadi Choorna*.

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