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Research Article

PHYSICOCHEMICAL CHARACTERIZATION AND HEAVY METAL ANALYSIS OF *MENISAMOOLA PARPAM*: A SIDDHA HERBO-MINERAL FORMULATION

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ABSTRACT

Menisamoola Parpam is a Siddha herbo-mineral formulation traditionally used in the management of respiratory disorders. Standardization of Siddha medicines through physicochemical and heavy metal analysis is essential to ensure their quality, safety, and efficacy**. Objective**: To evaluate the physicochemical parameters and heavy metal content of *Menisamoola Parpam*. **Materials and Methods:** The prepared sample of *Menisamoola Parpam* was subjected to physicochemical evaluation, including pH, total ash, acid-insoluble ash, and loss on drying. Heavy metal analysis for lead, cadmium, arsenic, and mercury was carried out in a NABL-accredited laboratory following standard AYUSH protocols. **Results:** The physicochemical analysis revealed a total ash value of 84.15%, acid-insoluble ash of 10.09%, pH of 11.09, and loss on drying of 0.71%. Heavy metal analysis showed lead (0.0086mg/L), cadmium (0.0001mg/L), arsenic (1.3010µg/L), and mercury (0.5091µg/L). All heavy metal concentrations were found to be within the WHO permissible limits. **Conclusion:** The results indicate that *Menisamoola Parpam* possesses acceptable physicochemical characteristics and complies with WHO safety limits for heavy metals. The formulation can therefore be considered safe with respect to heavy metal contamination and suitable for further pharmacological and clinical investigations.

INTRODUCTION

Bronchial asthma is a chronic inflammatory disorder of the airways characterized by recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly during the night or early morning. Airway inflammation leads to bronchial hyper-responsiveness and variable airflow obstruction, which may be reversible either spontaneously or with treatment. Asthma affects millions of individuals worldwide and constitutes a significant public health burden due to its increasing prevalence, morbidity, and impact on quality of life.

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In Siddha medicine, respiratory disorders resembling bronchial asthma are described under various disease entities associated with derangement of *Kabam* and *Vatham* humours. Traditional Siddha formulations have been extensively employed for the management of respiratory ailments owing to their bronchodilatory, expectorant, anti-inflammatory, and immuno-modulatory properties. Among these formulations, *Menisamoola Parpam* is a herbo-mineral preparation that has been traditionally indicated for respiratory diseases, including chronic cough and bronchial asthma.

The safety, quality, and efficacy of Siddha medicines depend largely on proper standardization and quality control measures. Physicochemical evaluation and heavy metal analysis are essential parameters for assessing the identity, purity, stability, and safety of herbo-mineral formulations. Such analyses help establish pharmacopoeial

standards and ensure compliance with regulatory requirements. Therefore, the present study was undertaken to evaluate the physicochemical characteristics and heavy metal content of *Menisamoola Parpam*. The formulation was subjected to determination of total ash, acid-insoluble ash, pH, loss on drying, and estimation of heavy metals such as lead, cadmium, arsenic, and mercury. The findings of this study provide scientific evidence for the standardization and safety assessment of *Menisamoola Parpam* intended for the management of bronchial asthma.

MATERIALS AND METHODS

Study Drug

Menisamoola Parpam consists of one ingredient named *Kuppaimeni* (*Acalypha indica)*. The whole plant of *Kuppaimeni* was procured fresh from Aminjikarai market, Chennai. The raw drug (whole plant) was authenticated in the Post graduate department of Siddha Pharmacology, Government Siddha Medical College, Chennai. The raw drug was purified as mentioned in Siddha text *Marundhu Sei Iyalum Kalaiyum.* Then the purified drug of desirable amount is cut into bits and dried in the shade. The dried parts are burnt in an *Uruli* into ash. The ash is powdered, spread in an agal, covered with its pair, clay cloth 5 layers are made to the junction of agals, dried and subjected to *Gaja pudam*. Again, this *Parpam* is subjected to a second plain *Pudam* in a pair of agals for final drug.

Table 1: Ingredient of *Menisamoola parpam*

S.no	Drug	Scientific Name	Part Used
1	*Kuppaimeni*	*Acalypha indica*	Whole plant

Sample Collection

The prepared sample of *Menisamoola Parpam* was collected from the Department of General Medicine, Government Siddha Medical College, Chennai, and submitted for analysis. The sample was received in a sealed zip-lock cover and assigned the laboratory sample identification number CHEN/DTL/2025-26/03/01.

Physicochemical Analysis

Physicochemical parameters were evaluated at the Drug Standardisation Research Unit, Regional Research Institute of Unani Medicine (RRIUM), Chennai, a NABL-accredited laboratory. The analyses were carried out according to AYUSH protocols and standard pharmacopoeial procedures**.**

The following parameters were assessed

Total Ash

The total ash value was determined by incinerating a known quantity of the sample in a silica crucible at a suitable temperature until it became free from carbon. The residue obtained was weighed, and the percentage of total ash was calculated**.**

Acid-Insoluble Ash

The total ash obtained was treated with dilute hydrochloric acid and filtered. The insoluble matter was collected, ignited, weighed, and expressed as acid-insoluble ash percentage.

pH Determination

The pH of the sample suspension was measured using a calibrated digital pH meter at room temperature.

Loss on Drying

Loss on drying was determined by drying the sample at 105°C until a constant weight was obtained. The percentage weight loss was calculated to estimate moisture content.

Heavy Metal Analysis

Heavy metal estimation was carried out for Lead (Pb), Cadmium (Cd), Arsenic (As), and Mercury (Hg) using validated analytical procedures as per AYUSH guidelines. The concentrations of these metals were compared with the permissible limits recommended by the World Health Organization (WHO) for herbal and herbo-mineral formulations.

Statistical Analysis

The obtained results were recorded and expressed as percentage values or concentration units as applicable. The results were compared with WHO permissible limits to assess the safety and quality of the formulation.

RESULT

Table 2: Physicochemical analysis of *Menisamoola Parpam*

S.No.	Test Parameter (s)	Result (s)	Test Method
1	Total ash	84.15 %	UPI Part-I, Vol. I – VI. & AYUSH Protocol
2	Acid Insoluble ash	10.09 %	
3	pH	11.09	

4	Loss on drying	0.71 %	

Heavy Metals

Table 3: Heavy metal analysis of *Menisamoola parpam*

Heavy/Toxic metals	Result	WHO Permissible limit (ppm)
Lead	0.0086 mg/L	10
Cadmium	0.0001 mg/L	0.3
Arsenic	1.3010 µg/L	3
Mercury	0.5091 µg/L	1

Interpretation

- The high total ash value (84.15%) indicates the mineral-rich nature of the *Parpam* formulation.
- Low loss on drying (0.71%) suggests minimal moisture content, which enhances stability and shelf life.
- The alkaline pH (11.09) is characteristic of many calcined mineral preparations.
- Mercury level (0.5091µg/L) is below the WHO permissible limit of 1µg/L, indicating that it is within the safe range.
- Lead, cadmium, and arsenic levels are also well below their respective permissible limits, demonstrating the safety of the formulation regarding heavy metal contamination.

DISCUSSION

Standardization of Siddha herbo-mineral formulations is essential to ensure their quality, safety, and therapeutic efficacy. In the present study, *Menisamoola Parpam* was evaluated for physicochemical parameters and heavy metal content as part of quality assessment. The total ash value (84.15%) was found to be high, which is characteristic of *Parpam* formulations due to their mineral-rich composition. Ash values provide information regarding the inorganic content and purity of the drug. The acid-insoluble ash value (10.09%) indicates the presence of siliceous matter and serves as an important parameter for determining the quality of mineral preparations.

The pH of *Menisamoola Parpam* was found to be 11.09, indicating its alkaline nature. Alkaline formulations are traditionally believed to help reduce *Kapha*-related disorders and may contribute to the therapeutic action of the drug in respiratory ailments such as bronchial asthma. The loss on drying value was 0.71%, indicating a very low moisture content. Lower moisture content minimizes microbial growth and improves the stability and shelf life of the formulation.

Heavy metal analysis revealed that lead (0.0086mg/L), cadmium (0.0001mg/L), arsenic (1.3010µg/L), and mercury (0.5091µg/L) were all within the permissible limits recommended by the World Health Organization. These findings demonstrate that the formulation is free from harmful levels of toxic metal contamination and supports its safety for therapeutic use. The results of the present study establish preliminary quality control parameters for *Menisamoola Parpam* and provide scientific evidence supporting its safety. Such standardization studies are important for the acceptance of Siddha medicines in evidence-based healthcare systems and for ensuring consistent quality of traditional formulations.

CONCLUSION

The present study evaluated the physicochemical characteristics and heavy metal profile of *Menisamoola Parpam*, a Siddha herbo-mineral formulation used in the management of bronchial asthma. The formulation exhibited acceptable physicochemical properties, including low moisture content and characteristic mineral composition. Heavy metal analysis demonstrated that the concentrations of lead, cadmium, arsenic, and mercury were within WHO permissible limits, indicating the safety of the formulation with respect to toxic metal contamination. The findings support the quality and safety of *Menisamoola Parpam* and provide baseline data for its standardization, further pharmacological investigations, and clinical applications.

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