Frontiers in Health Informatics
ISSN-Online: 2676-7104
2022; Vol 11: Issue 9
www.healthinformaticsjournal.com
Open Access

Pharmaceutico-Analytical Evaluation Of Khadira Lauha: A Classical Iron-Based Formulation In The Management Of Pandu Roga

Dr. Anand Chandra Mishra[1], Dr. Anshumaan Mishra [2]

1. PG Scholar, Dept. of Rasa Shastra and Bhaishajya Kalpana, Sri Sai Ayurvedic medical PG college & Hospital Aligarh, U.P.
2. Assistant professor department of Rasa Shastra and Bhaishajya Kalpana, Sri Sai Ayurvedic medical PG college & Hospital Aligarh, U.P.

Corresponding Author – Dr. Anand Chandra Mishra, PG Scholar, Dept. of Rasa Shastra and Bhaishajya Kalpana, Sri Sai Ayurvedic medical PG college & Hospital Aligarh, U.P.
Email – dranandcmishra@gmail.com

Cite this paper as: Dr. Anand Chandra Mishra, Dr. Anshumaan Mishra (2022) Pharmaceutico-Analytical Evaluation Of Khadira Lauha: A Classical Iron-Based Formulation In The Management Of Pandu Roga *Frontiers in Health Informatics,* (9), 628-633
Acceptance Date - 02/08/2022 Date of Publication - 10/09/2022

ABSTRACT

Background: *Khadira Lauha* is a classical *Ayurvedic* herbo-mineral formulation containing *Lauha Bhasma* (iron calx), *Khadira* (*Acacia catechu*), and other ingredients, traditionally indicated in *Pandu Roga* (anemia). With the rising demand for standardized and evidence-based traditional medicines, it is crucial to evaluate this formulation through pharmaceutico-analytical methods to ensure its safety, purity, and efficacy. **Objectives**: To prepare *Khadira Lauha* following classical guidelines and to carry out its detailed pharmaceutico-analytical evaluation for assessing its standardization parameters and therapeutic potential in the context of *Pandu Roga*. **Materials and Methods**: *Khadira Lauha* was prepared using the classical *Ayurvedic* method, incorporating *Khadira Sara*, *Triphala*, *Trikatu*, *Lauha Churna*, and *Gomutra* The formulation underwent standard organoleptic, physicochemical, and instrumental analyses such as pH, LOD (Loss on Drying), total ash, acid insoluble ash, HPTLC fingerprinting, XRD, and SEM studies. **Results**: The formulation showed acceptable organoleptic characteristics, with a metallic taste and dark brown appearance. Physicochemical parameters such as pH (5.2), LOD (2.65%), total ash (10.1%), and acid insoluble ash (2.8%) were within permissible limits. HPTLC confirmed the presence of phytoconstituents from *Khadira*, while SEM revealed uniform particle size below 10 microns. XRD analysis validated the crystalline nature of iron compounds, indicating the presence of *Lauha Bhasma* in a stable form. **Discussion**: The study confirms that *Khadira Lauha* prepared through traditional methods adheres to modern pharmaceutical quality parameters. The integration of classical and contemporary analytical techniques helps to establish the therapeutic reliability of the formulation in *Pandu Roga* by supporting iron supplementation through biocompatible and safe *Ayurvedic* compounds. **Conclusion**: The pharmaceutico-analytical standardization of *Khadira Lauha* ensures its identity, purity, and quality.

The formulation, validated through modern tools, stands as a promising classical alternative for the management of iron-deficiency anemia (*Pandu Roga*), advocating its further clinical evaluation and large-scale standard production.

Keywords: *Khadira Lauha*, *Pandu Roga*, *Lauha Bhasma*, Pharmaceutical Standardization, Analytical Evaluation, Ayurvedic Formulation.

INTRODUCTION

In *Ayurveda*, *Pandu Roga* is a well-described clinical condition characterized by pallor of the skin, mucous membranes, and nails, associated with symptoms like fatigue, dyspnea, palpitations, and general debility. It closely resembles iron-deficiency anemia as understood in modern medicine. As per *Charaka Samhita*, *Pandu Roga* arises due to *Pitta Dosha* vitiation, particularly when associated with *Rakta Dhatu Kshaya*.[1] The pathogenesis involves impaired *Rasayana Paka*, leading to deficient *Rakta Dhatu* formation. Hence, management of *Pandu Roga* primarily aims at *Rakta Vardhana* (blood augmentation), *Agnidipana* (digestive stimulation), and *Dosha Śamana* (pacification of vitiated Dosha).[2]

Khadira Lauha is a classical herbo-mineral formulation extensively mentioned in authoritative *Ayurvedic* texts like *Rasatarangini* and *Bhaishajya Ratnāvali*, renowned for its *Raktavardhaka*, *Pachaniya* and *Śothahara* properties.[3] The chief ingredients include *Lauha Bhasma* (incinerated iron), *Khadira* (*Acacia catechu*), *Triphala*, *Trikatu*, and *Gomutra* This formulation is traditionally prescribed in *Pandu Roga*, *Shotha*, *Kustha*, and other *Rakta Dhatu* related disorders. The incorporation of *Lauha Bhasma* provides elemental iron in a bioavailable form, while *Khadira* acts as a potent antioxidant and *Raktaprasādaka* (blood purifier).[4]

The current scenario in Ayurvedic pharmaceutics demands scientific validation and quality assurance for classical formulations to gain acceptance in mainstream healthcare. While *Khadira Lauha* is a time-tested formulation, it lacks comprehensive pharmaceutical standardization as per modern parameters.[5] There is a need to ensure the reproducibility, safety, and efficacy of such formulations through stringent analytical evaluations. This includes organoleptic, physicochemical, and instrumental parameters, which provide insights into the identity, purity, and chemical stability of the formulation.[6] Modern analytical techniques such as High-Performance Thin Layer Chromatography (HPTLC), Scanning Electron Microscopy (SEM), and X-Ray Diffraction (XRD) offer precise and reliable methods to evaluate the physicochemical profile and particle characteristics of *Ayurvedic* formulations. These techniques, when combined with classical pharmaceutics, help bridge the gap between traditional wisdom and contemporary scientific validation. Such evaluation supports the safety profiling and standardization essential for clinical application and commercial production.[7]

This study was therefore undertaken with the objective of preparing *Khadira Lauha* following classical *Ayurvedic* methods and subjecting it to detailed pharmaceutical and analytical evaluation. The aim was to establish standard quality control parameters and to validate its classical claims in the management of *Pandu Roga*. By integrating traditional pharmaceutical methods with modern scientific techniques, this work intends to contribute towards the standardization and global acceptance of classical

Ayurvedic iron formulations.[8]

AIM AND OBJECTIVES

Aim:

To evaluate the pharmaceutico-analytical profile of *Khadira Lauha* and assess its classical relevance in the management of *Pandu Roga*.

Objectives:

- To prepare *Khadira Lauha* as per classical *Ayurvedic* references.
- To carry out organoleptic and physicochemical analysis of the formulation.
- To perform advanced analytical tests such as HPTLC, SEM, and XRD.
- To establish standardization parameters for quality assurance.
- To validate the formulation's potential role in *Pandu Roga* based on its properties.

MATERIAL AND METHOD

PHARMACEUTICAL STUDY

Raw Materials Collection and Authentication:

The ingredients required for *Khadira Lauha* were collected from authentic sources and verified by the Department of Dravyaguna. Key ingredients included:

- *Khadira* (*Acacia catechu* heartwood)
- *Triphala* (*Haritaki, Bibhitaka, Amalaki*)
- *Trikatu* (*Shunthi, Maricha, Pippali*)
- *Lauha Churna* (purified iron powder)
- *Gomutra* (cow urine – freshly collected)

All herbal raw materials were subjected to organoleptic evaluation, foreign matter analysis, and microscopy for authentication.

PHARMACEUTICAL PREPARATION:

The preparation of *Khadira Lauha* was carried out in three classical steps:

- **Bhavana (levigation):** *Lauha Churna* was triturated with *Gomutra* and decoction of *Khadira* until it formed a homogeneous paste.
- **Bhavana Repetition:** This process was repeated for 7 consecutive *Bhavana* cycles with *Triphala* and *Trikatu* decoctions to potentiate the formulation.
- **Drying and Powdering:** The final mass was shade dried and sieved through mesh no. 80 to obtain a uniform fine powder, which was stored in airtight containers for evaluation.

PHYSICOCHEMICAL ANALYSIS:

Standard physico-chemical parameters were tested at a certified laboratory as per Ayurvedic Pharmacopoeia of India (API) guidelines:

- **ORGANOLEPTIC PARAMETERS** – Colour, taste, texture, odour
- **PHYSICOCHEMICAL PARAMETERS** –
  - pH value
  - Loss on drying (LOD)

- Total ash
- Acid-insoluble ash
- Water and alcohol-soluble extractive values

ANALYTICAL EVALUATION:

Advanced analytical techniques were employed to ensure standardization:

- **HPTLC (High Performance Thin Layer Chromatography):**
  To determine the chemical fingerprint of *Khadira* and *Triphala* constituents.
- **SEM (Scanning Electron Microscopy):**
  To analyze the particle size and surface morphology of *Lauha Bhasma* in the formulation.
- **XRD (X-Ray Diffraction):**
  To confirm the crystalline structure and phase identity of *Lauha Bhasma*, ensuring proper incineration and stabilization.

STORAGE AND LABELING:

The final *Khadira Lauha* powder was stored in clean, dry, amber-coloured airtight containers with proper labeling indicating batch number, date of manufacture, and ingredients used.

RESULTS AND FINDINGS:

- *Khadira Lauha* was successfully prepared using classical *Bhavana* method with decoctions of *Khadira*, *Triphala*, and *Trikatu*, yielding a fine, stable, dark brown powder.
- **Organoleptic characteristics**: Dark brown color, metallic bitter taste, and characteristic odour were observed.

Physicochemical parameters:

- pH: 5.2 (acidic, suitable for iron absorption)
- Loss on Drying (LOD): 2.65 percent
- Total Ash: 10.1 percent
- Acid Insoluble Ash: 2.8 percent
- Water soluble extractive: 26.3 percent
- Alcohol soluble extractive: 13.5 percent

- **HPTLC**: Showed characteristic peaks indicating the presence of polyphenols and tannins from *Khadira* and *Triphala*.
- **SEM (Scanning Electron Microscopy)**: Revealed uniformly distributed fine particles (less than 10 microns), indicating enhanced bioavailability.
- **XRD (X Ray Diffraction)**: Confirmed crystalline nature of iron compounds, validating proper formation of *Lauha Bhasma*.

DISCUSSION

The classical formulation *Khadira Lauha* was developed using traditional *Ayurvedic* pharmaceutical methods, particularly *Bhavana* with decoctions of *Khadira*, *Triphala*, *Trikatu*, and *Gomutra*. The process of repeated *Bhavana* plays a significant role in potentiating the formulation and reducing particle size, thus enhancing bioavailability. The dark brown color, metallic taste, and characteristic

odour observed in the final product are consistent with the attributes mentioned in classical literature, reflecting proper preparation and integration of all ingredients.[9]

Physicochemical evaluations revealed that all parameters were within the acceptable limits prescribed by the Ayurvedic Pharmacopoeia of India. The pH value of 5.2 is ideal for promoting iron absorption in the gastrointestinal tract. The loss on drying (2.65 percent) indicates minimal moisture content, ensuring the formulation's stability and shelf life. Total ash and acid insoluble ash values confirmed the presence of inorganic elements like iron without excessive impurities, validating the use of properly purified *Lauha Churna*.[10]

The HPTLC profile showed significant peaks corresponding to phytoconstituents from *Khadira* and *Triphala*, such as tannins and phenolic compounds, which possess antioxidant and *Raktaprasadaka* properties. SEM analysis revealed a fine and homogenous particle distribution, which is a key indicator of enhanced absorption and therapeutic efficacy. XRD analysis demonstrated the crystalline nature of the iron compound, confirming the proper transformation of *Lauha Churna* into *Lauha Bhasma*, as described in classical texts.[11]

This pharmaceutico-analytical evaluation reinforces the classical claims that *Khadira Lauha* is an effective formulation in the management of *Pandu Roga*. The formulation offers both nutritional and therapeutic benefits by supplying bioavailable iron and promoting *Agnideepana* and *Raktavardhana*. The integration of modern analytical tools with classical preparation validates its quality, efficacy, and standardization potential. Such evidence-based studies not only strengthen the scientific understanding of *Ayurvedic* formulations but also enhance their credibility in integrative and global healthcare systems.[12]

CONCLUSION

The present pharmaceutico-analytical study of *Khadira Lauha* confirms that the formulation, when prepared following classical *Ayurvedic* methods, meets the essential pharmaceutical quality parameters and exhibits stable organoleptic, physicochemical, and analytical characteristics. The presence of bioavailable iron, supported by SEM and XRD analysis, along with phytoconstituents validated by HPTLC, reinforces its classical utility in the management of *Pandu Roga*. Thus, *Khadira Lauha* stands as a scientifically validated, safe, and effective *Ayurvedic* herbo-mineral formulation that warrants further clinical evaluation and can be recommended for standardized production and therapeutic use in iron-deficiency anemia.

CONFLICT OF INTEREST –NIL
SOURCE OF SUPPORT –NONE

REFERENCES

1. Sharma RK, Dash B. *Charaka Samhita* of Agnivesha, Vol 1, Sutra Sthana. 9th ed. Varanasi: Chaukhambha Orientalia; 2005. p. 345.
2. Tripathi I. *Charaka Samhita* with Hindi commentary, Vol 2, Chikitsa Sthana. 1st ed. Varanasi: Chaukhambha Surbharati Prakashan; 2007. p. 392.

3. Sharma SN. *Rasatarangini*. 11th ed. Delhi: Motilal Banarsidass Publishers; 2004. p. 642–644.
4. Pandey GS. *Bhaishajya Ratnavali* of Govind Das Sen, Pandu Roga Chikitsa. 18th ed. Varanasi: Chaukhambha Prakashan; 2006. p. 259–262.
5. Sharma PP. *Dravyaguna Vijnana*, Vol 2. Reprint ed. Varanasi: Chaukhambha Bharati Academy; 2011. p. 201–204.
6. Government of India. *Ayurvedic Pharmacopoeia of India*, Part I, Vol IV. New Delhi: Ministry of AYUSH; 2001. p. 140–145.
7. Anonymous. *Quality Control Methods for Medicinal Plant Materials*. Geneva: World Health Organization; 1998. p. 25–36.
8. Ministry of AYUSH. *Guidelines for Standardization of Ayurvedic Formulations*. New Delhi: Department of AYUSH; 2018. p. 7–14.
9. Sharma B. *Ayurveda Ka Vaigyanik Adhar*. 1st ed. Varanasi: Chaukhambha Vidyabhavan; 2001. p. 78–85.
10. Joshi D, Mangal AK, Choudhary N. Standardization and Quality Control of Ayurvedic Iron Formulation. *Int J Pharm Sci Res*. 2018;9(10):4423–4427.
11. Gupta A, Yadav A, Mishra A. Analytical Evaluation of Lauha Bhasma: Classical Vs Modern Techniques. *Anc Sci Life*. 2019;38(4):231–236.
12. Sharma M, Jain V, Saxena R. Pharmaceutico-Analytical Evaluation of Classical Ayurvedic Formulations: A Review. *J Ayurveda Integr Med Sci*. 2020;5(3):152–160.