

Standardization and Formulation of Keshar Kalpana in Ayurveda: A Rasashastra Approach

Srishti Negi

Associate Professor

Department of Rasashastra & Bhaishajya Kalpana

Sarayu Institute of Ayurvedic Sciences, Uttar Pradesh

Email: *menegi.srishti76@gmail.com*

Abstract

The present study explores the formulation and standardization of Keshar Kalpana (saffron-based medicines) through an Ayurvedic Rasashastra approach. Saffron, known for its potent therapeutic properties, holds a significant place in Ayurvedic medicine. The research integrates traditional Ayurvedic methodologies with modern analytical techniques to ensure the efficacy, safety, and consistency of these formulations. This paper focuses on standardization protocols, quality control measures, and the formulation process of saffron-based medicines to bridge the gap between ancient knowledge and contemporary pharmaceutical practices. Analytical tools like High-Performance Thin Layer Chromatography (HPTLC), organoleptic characteristics, and bioactive content quantification have been employed for validation.

Keywords: *Keshar Kalpana, Saffron-based medicines, Standardization, Rasashastra, Ayurveda, HPTLC, Quality control, Formulation*

INTRODUCTION

Ayurveda, the ancient Indian system of medicine, is a holistic approach that dates back thousands of years and emphasizes the balance between body, mind, and spirit. It uses natural elements such as herbs, minerals, and metals to treat and prevent various health conditions. Among the many medicinal plants used in Ayurveda, saffron, known as Keshar in Sanskrit, holds a particularly prestigious position due to its potent therapeutic properties.

Saffron is highly revered in Ayurvedic texts for its ability to treat a wide range of ailments. Traditionally, it has been used to treat conditions such as digestive disorders, respiratory issues, reproductive health problems, and skin ailments. It has also been considered an important rasayana (rejuvenative) herb that enhances vitality, improves complexion, and supports mental clarity. Saffron-based formulations, or Keshar Kalpana, are frequently prescribed to improve memory, cognitive functions, and overall well-being, making them integral to various Ayurvedic therapeutic regimes.

However, despite its well-known benefits, maintaining the consistency and efficacy of saffron-based formulations poses a significant challenge. The therapeutic potential of saffron lies in its unique phytochemical composition, which can be affected by various factors such as cultivation conditions, harvesting, processing, and storage. To ensure the therapeutic integrity of saffron and its formulations, it is essential to establish robust standardization techniques.

This paper focuses on how ancient Ayurvedic practices related to Keshar Kalpana can be harmonized with modern scientific methodologies to achieve consistent, effective, and safe medicinal formulations. By leveraging both the traditional knowledge of **Rasashastra** and modern analytical tools, this research aims to provide a framework for the standardization of Keshar Kalpana.

Keshar (Saffron): Botanical and Pharmacological Profile

Saffron is derived from the dried stigma of the plant *Crocus sativus*, a perennial herb native to Southwest Asia. Each flower produces only three stigmas, which are handpicked, making saffron the most expensive spice in the world. Its vibrant red-orange color and unique aroma make it easily distinguishable.

The key bioactive compounds responsible for saffron's medicinal properties are **crocin**, **safranal**, and **picrocrocin**. Crocin is the compound that gives saffron its distinctive color and is known for its strong antioxidant properties. It helps protect the body from oxidative stress by neutralizing free radicals, which can damage cells and lead to chronic diseases. Safranal is responsible for the characteristic aroma of saffron and exhibits neuroprotective properties, making it beneficial for cognitive health. It has been found to improve memory, mood, and learning abilities, which is why saffron is often used in Ayurvedic formulations aimed at

treating mental health issues such as anxiety and depression. Picrocrocin contributes to the bitter taste of saffron and also possesses antioxidant and anti-inflammatory properties.

Saffron's broad pharmacological profile, including **antioxidant**, **anti-inflammatory**, **neuroprotective**, **anticancer**, **antidepressant**, and **antispasmodic** effects, makes it a versatile component in both traditional and modern medicine. Scientific studies have corroborated many of saffron's therapeutic claims. For instance, research has demonstrated its effectiveness in treating mild to moderate Alzheimer's disease, acting as a mood stabilizer, and improving cardiovascular health. The neuroprotective properties of saffron make it a valuable herb in treating age-related cognitive decline, which aligns with its traditional use in Ayurveda to enhance memory and mental clarity.

Saffron's unique pharmacological attributes make it indispensable in many Ayurvedic preparations, especially in formulations that aim to rejuvenate and strengthen the body. In **Rasashastra**, where the focus is on the alchemical transformation of metals and minerals into therapeutic substances, saffron is often used as a catalyst to enhance the efficacy of these formulations.

Rasashastra Approach to Formulation

Rasashastra is a specialized branch of Ayurveda that deals with the preparation of medicines using metals, minerals, and herbs. It combines principles from both chemistry and medicine, using various processes to purify, incinerate, and potentiate substances to create safe and effective remedies. Rasashastra plays a pivotal role in the formulation of **Keshar Kalpana**, integrating saffron with other ingredients to amplify its therapeutic properties.

The Rasashastra approach to formulation follows strict protocols that ensure the potency and safety of the medicinal products. These protocols include **Shodhana** (purification), **Marana** (incineration), **Bhavana** (levigation), and **Parpati Kalpana** (preparation of thin flakes or tablets). The processes are designed not only to eliminate impurities from raw materials but also to enhance their bioavailability and efficacy.

1. **Shodhana (Purification)**: Shodhana is the first step in the preparation of saffron-based formulations. In this process, saffron is purified using various herbal liquids.

Purification is a critical step because it removes any impurities or unwanted elements that may reduce the effectiveness of saffron. This step ensures that the saffron retains its pure bioactive compounds, which are essential for its medicinal properties.

2. **Marana (Incineration):** Marana is typically applied to metals and minerals used in Rasashastra. Although saffron itself does not undergo Marana, this process is relevant when saffron is combined with other ingredients that need incineration. For example, if Keshar Kalpana includes metals such as gold or mercury (which are common in Rasashastra formulations), they must be properly incinerated to reduce their toxicity and enhance their therapeutic action. Marana transforms the metals into bhasma (ash), which can be safely consumed and has potent medicinal properties.
3. **Bhavana (Levigation):** After purification and incineration, the ingredients are subjected to Bhavana, where they are triturated or levigated with specific liquids or herbal extracts, including saffron. This process enhances the potency of the formulation by ensuring that the therapeutic properties of saffron and other ingredients are evenly distributed throughout the preparation. Bhavana also improves the bioavailability of saffron, making it easier for the body to absorb and utilize the active compounds.
4. **Parpati Kalpana (Preparation of Thin Flakes or Tablets):** In Parpati Kalpana, the final formulation is shaped into thin flakes or tablets for easy administration. This step ensures that the formulation is in a form that is stable, easy to consume, and has a long shelf life. The traditional knowledge of Rasashastra emphasizes that the method of preparation can significantly affect the efficacy of a formulation, and great care is taken to ensure that the final product retains its therapeutic potential.

The principles of Rasashastra, when applied to the formulation of Keshar Kalpana, create a potent, safe, and efficacious medicinal product. Saffron acts as a **yogavahi** (a catalyst that enhances the action of other substances) in these formulations, increasing the bioavailability and therapeutic potential of the combined ingredients.

In modern terms, this approach can be compared to pharmaceutical practices that focus on **phytochemical extraction, purification, and enhancement of bioavailability** in drug development. The ancient Ayurvedic process ensures that the active compounds in saffron, such as crocin, safranal, and picrocrocin, are preserved and amplified during the preparation, ensuring consistent therapeutic outcomes.

Table 1: Steps in Rasashastra-based Formulation of Keshar Kalpana

Step	Description
Shodhana	Purification of Keshar using herbal liquids
Marana	Incineration of other minerals for stability
Bhavana	Levigation with Keshar to potentiate the mixture
Parpati Kalpana	Formation of thin flakes for easy administration

STANDARDIZATION PROTOCOLS

Ensuring the consistency of Ayurvedic formulations is critical in modern medicine. For Keshar Kalpana, various standardization parameters are followed, such as organoleptic tests (color, odor, taste), physical and chemical analyses, and chromatographic fingerprinting methods like HPTLC.

Table 2: Standardization Parameters for Keshar Kalpana

Parameter	Methodology
Organoleptic Characteristics	Color, odor, and taste evaluation
Moisture Content	Gravimetric method
Chromatographic Profile	HPTLC for crocin and safranal
Bioactive Content	Spectrophotometric quantification of crocin

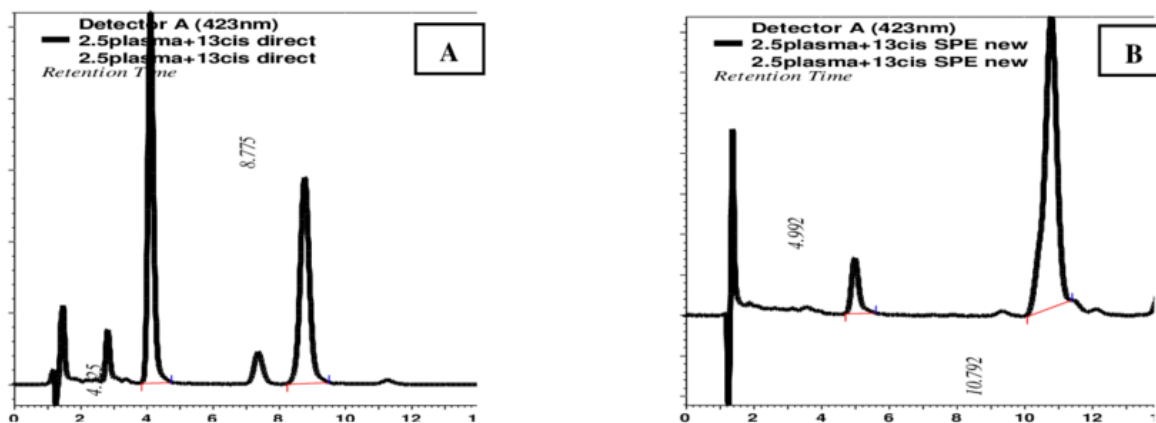


Figure 1: HPTLC Chromatogram of Keshar Kalpana

FORMULATION PROCESS OF KESHAR KALPANA

The formulation of Keshar Kalpana involves a detailed process to retain the therapeutic properties of saffron. First, the saffron is purified, followed by its incorporation into a base of other medicinal herbs. This is then processed using levigation and grinding techniques, commonly employed in Rasashastra. The final product is tested for its physicochemical properties, ensuring that it meets Ayurvedic pharmacopeial standards.

Table 3: Formulation Ingredients for Keshar Kalpana

Ingredient	Ayurvedic Name	Quantity (per dose)
Saffron	Keshar	50 mg
Triphala	---	100 mg
Ghee	Ghrita	200 mg
Ashwagandha	---	150 mg

MODERN ANALYTICAL METHODS USED FOR STANDARDIZATION

HPTLC, spectrophotometry, and gas chromatography-mass spectrometry (GC-MS) are some of the modern analytical techniques employed to ensure the quality of saffron-based medicines. These techniques help in the detection and quantification of active components like crocin, safranal, and picrocrocin.

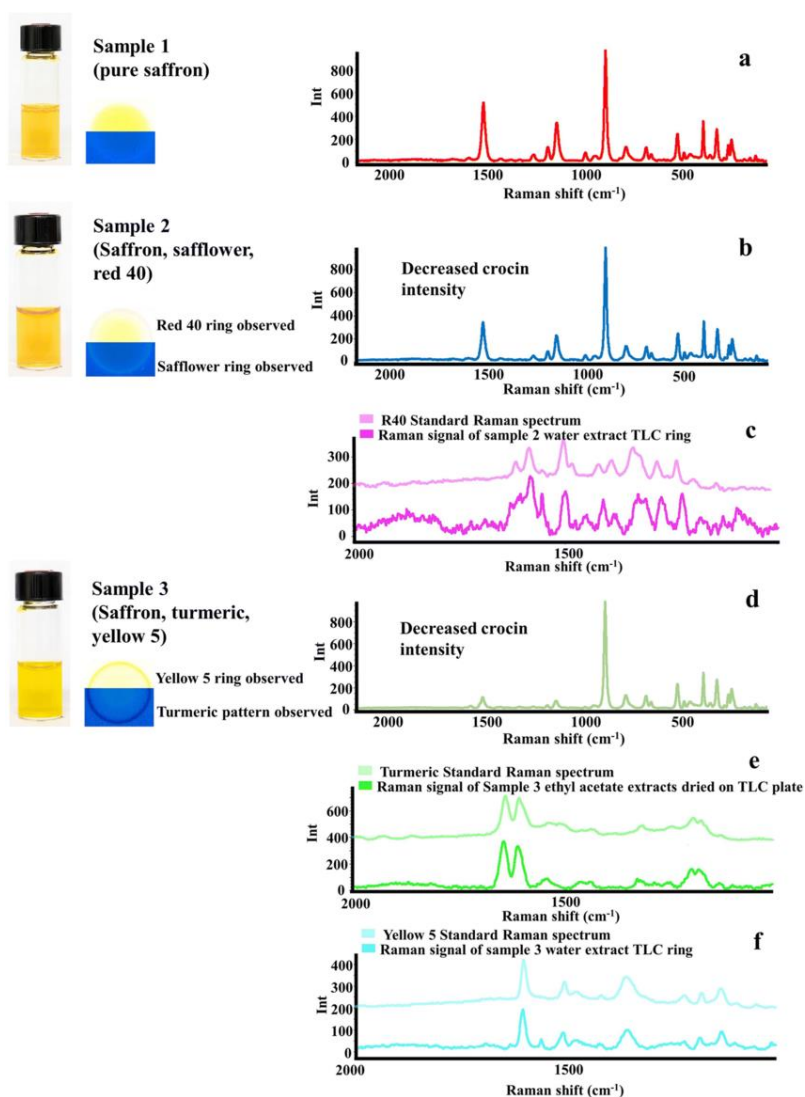


Figure 2: HPTLC vs. Spectrophotometric Analysis of Crocin Levels

QUALITY CONTROL MEASURES

In addition to standardization, stringent quality control measures are applied to Keshar Kalpana. These measures ensure that the final product is free from contaminants and meets the required safety standards. Tests for heavy metals, microbial contamination, and pesticide residues are conducted using atomic absorption spectrometry and microbial assays.

CONCLUSION

The formulation and standardization of Keshar Kalpana through the Rasashastra approach offer a robust framework for integrating traditional knowledge with modern science. By following rigorous standardization protocols and leveraging modern analytical tools, the therapeutic efficacy and safety of saffron-based medicines can be ensured.

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