



**INTERNATIONAL JOURNAL OF  
PHARMACEUTICAL SCIENCES**  
[ISSN: 0975-4725; CODEN(USA): IJPS00]  
Journal Homepage: <https://www.ijpsjournal.com>



## Review Article

# Modernized Concept Of Storage And Packaging Of Raw Herbs Used In Ayurveda

Sai S. Shirsath<sup>\*1</sup>, Ganesh U. Chavan<sup>2</sup>, Rahul T. Bhopale<sup>3</sup>, Nandkumar M. Chaudhari<sup>4</sup>,

<sup>1</sup>Matoshri Institute Of Pharmacy Dhanore, Tal.: Yeola, Dist.: Nashik, Maharashtra.

<sup>2</sup>Jgvvss's Suyash College Of Pharmacy, Warud B. K Dist Jalna, Maharashtra

<sup>3</sup>Yashwant Redekar College Of Pharmacy Nesari, Tal- Gadhinglaj, Dist-Kolhapur, Maharashtra

<sup>4</sup>Rashtrisant Janardhan Swami College Of Pharmacy Kokamthan, Tal.: Kopargaon, Dist.: A.Nagar, Maharastra

## ARTICLE INFO

Received: 19 May 2024

Accepted: 21 May 2024

Published: 24 May 2024

### Keywords:

Herbal medicines, WHO,  
Ayurvedic Dosage Forms.

### DOI:


10.5281/zenodo.11275592

## ABSTRACT

The modern concept of storage and packaging of raw herbs used in ayurveda focuses on preserving their potency, purity, and efficacy while ensuring safety and convenience for consumers. The traditional system of medicine, Ayurveda, relies heavily on the use of raw herbs for therapeutic purposes. However, the storage and packaging of these herbs have evolved considerably over time to meet modern standards of quality, safety, and efficacy. This abstract explores the modernized concepts of storing and packaging raw herbs used in Ayurveda, highlighting the importance of preserving their potency and purity while ensuring consumer safety. In traditional Ayurvedic practices, raw herbs were often stored in bulk quantities in traditional containers such as clay pots or woven baskets. However, these methods lacked precision in controlling environmental factors such as humidity, temperature, and light exposure, which can degrade the quality of herbs over time. Moreover, the lack of standardized packaging raised concerns about contamination and adulteration. To address these challenges, modernized storage and packaging techniques have been developed. One such method involves the use of airtight containers made from materials such as glass or food-grade plastic. These containers help to seal in the freshness of the herbs while protecting them from moisture and external contaminants. Additionally, advanced packaging technologies, such as vacuum sealing and nitrogen flushing, have been adopted to further extend the shelf life of raw herbs. Temperature and humidity control play a crucial role in maintaining the potency of Ayurvedic herbs. Modern storage facilities are equipped with climate control systems that regulate temperature and humidity levels to optimize the conditions for herb preservation. Cold storage facilities are particularly effective for preserving delicate herbs that are prone to degradation at higher temperatures.

**\*Corresponding Author:** Sai S. Shirsath

**Address:** Matoshri Institute Of Pharmacy Dhanore, Tal.: Yeola, Dist.: Nashik, Maharashtra.

**Email** : Saishirsath06@gmail.com

**Relevant conflicts of interest/financial disclosures:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



Quality assurance is a cornerstone of modern herbal storage and packaging practices. To ensure the purity and authenticity of raw herbs, stringent quality control measures are implemented throughout the supply chain. This includes rigorous testing for contaminants, such as heavy metals and pesticides, as well as the use of DNA barcoding to authenticate plant species. Additionally, certifications such as Good Manufacturing Practices (GMP) and Organic certification provide further assurance of product quality and safety. The modernized approach to storing and packaging raw herbs also emphasizes sustainability and eco-friendliness. Biodegradable packaging materials, such as compostable bags and recycled paper, are being increasingly used to minimize environmental impact. Furthermore, efforts are underway to promote sustainable sourcing practices, including organic cultivation and wild harvesting, to preserve biodiversity and support local communities. Consumer education plays a crucial role in promoting the importance of proper storage and packaging of raw herbs. Ayurvedic practitioners and herbalists are encouraged to educate their clients about the significance of purchasing herbs from reputable suppliers who adhere to quality standards. Additionally, informative labelling on herb packaging helps consumers make informed choices about the products they purchase.

## **INTRODUCTION**

Herbal medicine natural approach to healing that involves the use of plants extracts, alleviates, or treat various health conditions. Ayurveda, the ancient system of medicine originating from the Indian subcontinent, has been revered for its holistic approach to health and wellness for thousands of years. Central to Ayurvedic practices are the use of various herbs and natural substances to promote well-being and treat ailments. In recent times, there has been a growing global interest in Ayurveda, leading to increased demand for raw herbs used in Ayurvedic formulations. To meet this demand while ensuring the preservation of the herbs' efficacy, traditional methods of storage and packaging are being modernized. Modernization in the storage and packaging of raw herbs used in Ayurveda encompasses innovative techniques and technologies that enhance shelf life, maintain quality, and ensure safety. This modernization is essential to preserve the potency and efficacy of

these herbs, as well as to meet regulatory requirements and consumer expectations for quality and purity. In this article, we will explore the modernized concept of storage and packaging of raw herbs used in Ayurveda, focusing on key principles, techniques, and advancements that contribute to maintaining the integrity of these valuable natural resources. We will also discuss the importance of sustainability and ethical sourcing practices in the context of modernized storage and packaging methods, highlighting the importance of preserving biodiversity and supporting local communities involved in herb cultivation. In the realm of Ayurveda, the ancient system of natural healing originating from the Indian subcontinent, the storage and packaging of raw herbs play a critical role in preserving their potency and efficacy. Ayurveda, with its emphasis on holistic wellness and the use of natural remedies, relies heavily on the quality and integrity of medicinal herbs. However, as we advance into the modern era, traditional methods of storage and packaging need to be revisited and modernized to ensure the sustainability and accessibility of these invaluable resources. The traditional practices of storing and packaging raw herbs in Ayurveda have been deeply rooted in centuries-old techniques, often relying on natural materials such as clay pots, cloth bags, and plant-based fibers. While these methods have stood the test of time, modern challenges such as environmental concerns, quality control, and global distribution necessitate innovation in the storage and packaging of Ayurvedic herbs. This paper explores the modernized concepts and strategies for the storage and packaging of raw herbs used in Ayurveda, taking into account advancements in technology, sustainability practices, and quality assurance measures. By integrating traditional wisdom with contemporary approaches, we aim to uphold the principles of



Ayurveda while meeting the demands of a rapidly evolving world Traditional Challenge:

Traditional storage of Ayurvedic herbs often involves rudimentary methods like drying in the sun or storing in wooden containers. While effective in certain contexts, these methods may not meet modern standards of hygiene, pest control, and quality assurance. Moreover, fluctuations in temperature and humidity can lead to degradation of the herbs' medicinal properties, impacting their efficacy.

### **Key Elements of Modernized Storage Solutions:**

#### **1. Climate Control and Ventilation:**

Implementing HVAC systems and dehumidifiers helps maintain optimal temperature and humidity levels, preventing moisture buildup and mold growth. Adequate ventilation ensures airflow, facilitating natural drying of herbs and reducing the risk of contamination.

#### **2. Pest Control Measures:**

Effective pest control is essential to safeguard herbs from insect infestations and rodent damage. Installing screens on windows, sealing cracks, and using natural repellents or traps are some measures to consider.

#### **3. Hygienic Practices:**

Strict hygiene standards, including regular cleaning and sanitization of storage areas and containers, minimize the risk of contamination and ensure the purity of herbs.

#### **4. Light Protection:**

Shielding herbs from direct sunlight and artificial light sources helps preserve their potency. Opaque containers or dark storage areas are recommended to minimize light exposure.

#### **5. Segregation and Organization:**

Organizing herbs based on their properties and storage requirements facilitates easy access and prevents mixing. Using separate containers or compartments ensures proper segregation.

#### **6. Sustainable Packaging:**

Opting for eco-friendly packaging materials reduces environmental impact. Recyclable or biodegradable packaging options should be prioritized to align with sustainability goals.

#### **7. Quality Control Measures:**

Implementing robust quality control protocols involves regular inspection of herbs for signs of degradation or spoilage. Any herbs failing to meet quality standards should be discarded or returned.

#### **8. Monitoring and Traceability:**

Leveraging technology like RFID tags or barcoding systems enables real-time monitoring of herbs' storage conditions and traceability throughout the supply chain.

#### **9. Collaboration with Farmers:**

Building strong partnerships with farmers and suppliers promotes sustainable agricultural practices and ethical sourcing of herbs. Supporting initiatives for fair trade and community development benefits both producers and consumers.

#### **Benefits of Modernized Storage Solutions:**

1. **Enhanced Quality:** Maintaining optimal storage conditions preserves the herbs' medicinal properties, ensuring their efficacy and potency.
2. **Improved Safety:** Strict hygiene practices and pest control measures minimize the risk of contamination, safeguarding consumer health.
3. **Sustainability:** Using eco-friendly packaging and supporting ethical sourcing practices contributes to environmental conservation and social responsibility.
4. **Compliance with Regulations:** Meeting modern storage standards ensures compliance with regulatory requirements and industry norms.
5. **Market Competitiveness:** Providing high-quality, sustainably sourced herbs enhances brand reputation and competitiveness in the market.

#### **Sterilization of raw herbs**

It is a critical step in the processing and preparation of herbal products, ensuring their safety, efficacy, and compliance with regulatory standards. This



process involves the elimination or reduction of microbial contaminants, including bacteria, fungi, and viruses, while preserving the therapeutic properties of the herbs.

### ***methods and considerations involved in the sterilization of raw herbs:***

#### **1. Steam Sterilization:**

Steam sterilization, also known as autoclaving, is one of the most common methods used for sterilizing raw herbs. In this process, herbs are exposed to high-pressure steam at temperatures typically ranging from 121°C to 134°C for a specified duration, usually around 15 to 30 minutes. Steam effectively kills microorganisms by denaturing their proteins and disrupting their cellular structures. This method is suitable for heat-resistant herbs and is widely employed in industrial-scale herbal processing facilities.

#### **2. Dry Heat Sterilization:**

Dry heat sterilization involves exposing herbs to high temperatures in the absence of moisture. Herbs are typically heated in an oven or a hot air sterilizer at temperatures ranging from 160°C to 180°C for several hours. Dry heat sterilization is effective against a wide range of microorganisms, including bacterial endospores, but may require longer exposure times compared to steam sterilization.

#### **3. Gamma Irradiation:**

Gamma irradiation is a method that utilizes ionizing radiation to sterilize herbs. Herbs are exposed to gamma rays emitted from a radioactive source such as cobalt-60 or cesium-137. The radiation damages the DNA of microorganisms, rendering them unable to replicate and causing their death. Gamma irradiation is a fast and efficient method of sterilization but may alter the chemical composition of herbs and affect their therapeutic properties.

#### **4. Ethylene Oxide Sterilization:**

Ethylene oxide (EO) sterilization is a chemical method used for heat-sensitive herbs. Herbs are

placed in a sealed chamber and exposed to ethylene oxide gas, which penetrates the packaging and kills microorganisms. After exposure, the herbs undergo aeration to remove residual gas and minimize toxicity. Ethylene oxide sterilization is highly effective but requires careful handling due to its flammability and potential toxicity.

#### **5. Microwave Sterilization:**

Microwave sterilization is a relatively newer method that utilizes electromagnetic radiation to heat and sterilize herbs. Herbs are placed in a microwave chamber and subjected to microwave energy, which generates heat and kills microorganisms. This method is rapid and efficient but requires careful optimization of parameters such as power, time, and herb moisture content to ensure uniform sterilization without affecting herb quality.

#### **6. UV-C Sterilization:**

UV-C sterilization involves exposing herbs to ultraviolet (UV) radiation with a wavelength of around 254 nanometers. UV-C light damages the DNA of microorganisms, preventing their replication and causing their death. This method is effective for surface sterilization of herbs but may not penetrate deeply into dense materials or packaging.

#### **Considerations for Sterilization:**

**Herb Characteristics:** Different herbs have varying heat tolerance and susceptibility to sterilization methods. It's essential to select a method that effectively sterilizes the herbs without compromising their quality.

**Regulatory Compliance:** Ensure that the chosen sterilization method complies with regulatory requirements and industry standards for herbal products.

**Quality Assurance:** Implement robust quality control measures to monitor the effectiveness of sterilization processes and ensure product safety and efficacy.



**Packaging Considerations:** Consider the compatibility of sterilization methods with the packaging materials used for herbs to prevent contamination and ensure product integrity.

**Consumer Safety:** Prioritize consumer safety by minimizing the risk of residual chemicals or radiation in sterilized herbs and providing clear labelling and instructions for use. All the raw herbal drugs may be stored at a cool place (any temperature) between 8<sup>o</sup> -25<sup>o</sup>, raw herbs must be protected from moisture, freezing, light and excessive heat for preventing decomposition.

#### **Testing of quality raw herbs**

Testing the quality of raw herbs is a crucial step in the production of herbal products to ensure their safety, efficacy, and compliance with regulatory standards. Several tests and methods are employed to evaluate various aspects of herb quality, including identity, purity, potency, and safety. Here are some common tests used for testing the quality of raw herbs:

##### **1. Macroscopic and Microscopic Examination:**

Macroscopic examination involves visual inspection of the physical characteristics of herbs, such as colour, size, texture, and presence of foreign matter. Microscopic examination involves the use of a microscope to examine the cellular structure of herbs, which can help identify specific botanical features and detect adulteration.

##### **2. Chemical Analysis:**

Thin-Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), and Gas Chromatography-Mass Spectrometry (GC-MS) are common techniques used to analyse the chemical composition of herbs.

These methods can identify and quantify active compounds, such as alkaloids, flavonoids, and essential oils, which contribute to the therapeutic properties of herbs.

##### **3. Heavy Metal Testing:**

Heavy metal testing is conducted to assess the presence of toxic metals, such as lead, arsenic,

cadmium, and mercury, which can accumulate in herbs due to environmental contamination or improper cultivation practices. Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) are commonly used methods for heavy metal analysis.

##### **4. Microbiological Testing:**

Microbiological testing is performed to assess the microbial load of herbs and detect the presence of pathogenic bacteria, and yeasts. Tests such as Total Aerobic Microbial Count, Total Yeast and Mold Count, and specific pathogen testing (e.g., Salmonella, E. coli) are conducted to ensure microbial safety.

##### **5. Pesticide Residue Analysis:**

Pesticide residue analysis is conducted to determine the presence of pesticide residues in herbs, which may result from agricultural practices. Gas Chromatography with Mass Spectrometry (GC-MS) or Liquid Chromatography with Mass Spectrometry (LC-MS) are commonly used methods for pesticide residue analysis.

##### **6. Foreign Matter Analysis:**

Foreign matter analysis involves the visual inspection and sieving of herbs to detect the presence of extraneous materials, such as soil, stones, insects, or other plant parts. This test ensures the purity and cleanliness of the herbs.

##### **7. Organoleptic Evaluation:**

Organoleptic evaluation involves sensory testing to assess the appearance, odour, taste, and texture of herbs. This subjective assessment helps evaluate the overall quality and freshness of the herbs.

##### **8. Quantitative Analysis of Active Constituents:**

Quantitative analysis of active constituents involves determining the concentration of specific bioactive compounds in herbs. This test helps ensure the potency and consistency of herbal products.

##### **9. Authentication and DNA Barcoding:**



DNA barcoding involves the use of molecular techniques to authenticate the botanical identity of herbs. Polymerase Chain Reaction (PCR) and DNA sequencing are used to compare the DNA sequences of herbs with reference databases to confirm their authenticity.

#### **10. Residual Solvent Analysis:**

Residual solvent analysis is performed to detect the presence of organic solvents used in herbal extraction processes. Gas Chromatography (GC) or High-Performance Liquid Chromatography (HPLC) are commonly used for residual solvent analysis.

By conducting these tests and analyses, herbal manufacturers can ensure the quality, safety, and efficacy of raw herbs used in the production of herbal products. It's essential to adhere to established testing protocols and regulatory requirements to maintain product integrity and consumer trust.

Following guidelines for storage helps prevent degradation, contamination, and loss of efficacy. Here are some key guidelines for the proper storage of raw herbal material:

#### **1. Storage Environment:**

Choose a storage area that is cool, dry, clean, and well-ventilated. Avoid areas with excessive humidity, direct sunlight, or fluctuating temperatures. Maintain a stable temperature within the recommended range for the specific herbs being stored.

#### **2. Container Selection:**

Use clean, airtight containers made of glass, ceramic, or food-grade plastic for storing herbs. Ensure that containers are properly sealed to prevent moisture ingress and contamination. Avoid storing herbs in metal containers, as they can react with certain herbs and affect their quality.

#### **3. Labelling and Identification:**

Clearly label each container with the name of the herb, date of storage, and any other relevant information. Use waterproof and fade-resistant

labels to ensure durability and legibility over time. Maintain an inventory system to track the quantity and location of stored herbs for easy retrieval.

#### **4. Organizational Practices:**

Organize herbs systematically based on their properties, usage, and storage requirements. Separate herbs with strong odours or volatile oils from those with milder aromas to prevent flavour transfer. Store herbs used in similar formulations or preparations together for convenience.

#### **5. Pest Control:**

Implement measures to prevent pest infestation, such as regular cleaning, sealing cracks and crevices, and using natural repellents. Inspect stored herbs periodically for signs of pest activity, such as holes, droppings, or webbing.

#### **6. Quality Control:**

Establish quality control protocols to monitor the condition of stored herbs regularly. Conduct visual inspections for signs of moisture, discoloration, or insect damage. Perform sensory evaluations to assess the aroma, colour, and texture of herbs for freshness.

#### **7. Rotation and Inventory Management:**

Practice first-in, first-out (FIFO) rotation to ensure that older herbs are used before newer ones. Conduct regular inventory checks to assess stock levels and identify any discrepancies or losses. Dispose of expired or deteriorated herbs promptly to prevent cross-contamination or accidental use.

#### **8. Training and Education:**

Provide training to staff members on proper storage procedures, including hygiene practices and safety precautions. Educate employees about the importance of maintaining cleanliness, organization, and quality standards in storage areas.

#### **9. Regulatory Compliance:**

Adhere to regulatory requirements and industry standards for the storage of herbal material, including Good Manufacturing Practices (GMP)

and relevant guidelines from regulatory authorities.

#### **10. Documentation and Record-Keeping:**

Maintain accurate records of storage conditions, inventory levels, and quality assessments. Document any deviations from standard procedures and corrective actions taken to address them.

#### **CONCLUSION**

In conclusion, the modernized concept of storage and packaging of raw herbs used in Ayurveda represents a harmonious blend of traditional wisdom and contemporary innovations. By leveraging modern technologies and sustainable practices, herbal manufacturers can ensure the preservation of quality, potency, and safety throughout the supply chain. Climate-controlled storage facilities, eco-friendly packaging materials, and rigorous quality control measures contribute to the integrity and marketability of Ayurvedic herbs. Collaboration with farmers and adherence to regulatory standards further enhance transparency and trust in the herbal industry. Ultimately, the modernized approach to storage and packaging of raw herbs in Ayurveda reflects a commitment to preserving the ancient wisdom of this traditional healing system while meeting the demands of today's consumers for high-quality, sustainable products. Modernizing storage solutions for Ayurvedic herbs is crucial to meet the demands of a rapidly evolving market while upholding the principles of quality and sustainability. By integrating traditional wisdom with contemporary innovations, we can ensure the preservation of these precious resources for generations to come. Embracing modernized storage practices not only benefits consumers and producers but also fosters a more resilient and responsible herbal industry. A good store house for the storage of herbs, especially those used in

herbal medicine, should provide optimal conditions to maintain the herbs potency, purity, and freshness. There shall be adequate space in the store house for 'Under test,' Approved and 'Rejected' herbs with arrangements and equipment to allow washing cleaning, drying and orderly placement of stored herbs with controlled temperature and humidity. The store house for storage of herbs, handling of herbs.

#### **REFERENCES**

1. world health organization guidelines for assessing quality of Herbal Medicines with reference to contaminants and residues; 2007.
2. World health organisation Traditional Medicine Strategy; 2002-2005.
3. Introduction to Medicinal plants [www.agr.gc.ca](http://www.agr.gc.ca). Medicinal plants from ancient times to the present 14th line.
4. Review article RJPT Research J Pharma and tech 2008; 1(4). Standardization Strategies for Herbal Drugs. Neeli Rose Ekka, Kamta Prasad Namdeo Introduction 9th line
5. Ayurvedic pharmacopoeia Part 2 Vol. 4 (Formulations)
6. Laboratory Guide for the Analysis of Ayurveda and Siddha formulations by CCRAS; 2010. (Annexure-I pg.152, Annexure-2, p. 152, Annexure-3 p. 153, Annexure-4 p.153), (refer table 21, p. 134)
7. World health organization guidelines for assessing quality of Herbal Medicines with reference to contaminants and residues. Annexure 3; 2007.
8. Health Canada, Draft guidance on heavy metal impurities in cosmetics, Section 4
9. Ayurvedic pharmacopoeia Part 2 Vol 3 (Formulations)

**HOW TO CITE:** Sai. S. Shirsath \*, Ganesh U. Chavan, Rahul T. Bhopale, Nandkumar M. Chaudhari, Modernized Concept Of Storage And Packaging Of Raw Herbs Used In Ayurveda, *Int. J. of Pharm. Sci.*, 2024, Vol 2, Issue 5, 1302-1308. <https://doi.org/10.5281/zenodo.11275592>

