Indian J. Applied & Pure Bio. Vol. 40(3), 1805-1810 (2025). **ISSN: 0970-2091**
A web of Science Journal

Assessing moisture level in Shunthi (*Zingiber officinale* Roscoe): a comprehensive analytical evaluation

Ruhi Kotadiya[1] and Satej T. Banne[2]

[1,2]Department of Dravyaguna, Parul Institute of Ayurved, Parul University, Vadodara – 391760 (India)
[1]Mobile: 7984065116, Email: mruhipatel@gmail.com
[2]Mobile: 9099867731, Email: satej.banne@paruluniversity.ac.in

Abstract

This research focuses on evaluating the moisture content of Shunthi (*Zingiber officinale* Roscoe), a highly valued herbal remedy renowned for its extensive health benefits. The moisture content is crucial for ensuring the stability, potency, and efficacy of herbal products, as excessive moisture can lead to chemical degradation, microbial growth, and altered physical properties. The Loss on Drying (LOD) method was employed to determine the moisture content of the crude drug sample, which was procured from M/S. PARUL AYURVED PHARMACY, LIMDA, TALUKA – WAGHODIYA, DIST. – VADODARA-391760 GUJARAT STATE, INDIA LICENCE NO. GA/1842 and analyzed in the Quality Control Lab of Parul Institute of Ayurved. The results indicated a moisture content of 8.008%, demonstrating effective dehydration and adherence to acceptable standards for dried herbal products. The study highlights that high moisture levels can facilitate hydrolysis, compromising active ingredient stability, while also providing an ideal environment for microbial contamination. Additionally, moisture influences essential physical characteristics such as texture, flowability, and compressibility, which are vital for pharmaceutical formulation. Proper moisture control is emphasized during storage and transportation to prevent consistency changes, particularly in hygroscopic materials. This research underscores the importance of accurately determining moisture content to maintain the therapeutic efficacy of herbal medicines and advocates for further studies on optimizing drying techniques and environmental conditions to enhance the stability of crude drugs like Shunthi (*Zingiber officinale* Roscoe).

Key words : Moisture content, Loss on Drying (LOD), Chemical degradation, Drying process, Pharmaceutical quality.

---

[1]Third year Post Graduate Scholar, [2]Associate Professor & HOD

Ginger, or *Shunthi* (*Zingiber officinale* Roscoe), is a powerful rhizome that is praised for both its flavor and its many health advantages. A plant-based spice called ginger rhizome is used to cure a variety of illnesses, from gastrointestinal infections to cancer, both personally and professionally. *Shunthi* (*Zingiber officinale* Roscoe) is well-known in traditional medicine for its anti-inflammatory, antioxidant, and digestive qualities in addition to its culinary usage. Its flavor enriches a variety of foods and can be used as a natural cure for cold and nausea due to its warm, spicy taste. *Shunthi* (*Zingiber officinale* Roscoe) is still loved in the cooking and as a general health supplement because of its extensive history and many uses.[5]

Shunthi (*Zingiber officinale* Roscoe), or dried ginger, is praised in Ayurveda for its many health advantages and warming qualities. Due to its "*Katu*" (Pungent) and "*Tikta*" (Bitter) Rasa, it is particularly useful for balancing the *Kapha* and *Vata Doshas*.[6] *Shunthi* (*Zingiber officinale* Roscoe) is well known for its capacity to improve metabolic processes, ease nausea, and assist with digestion. It is frequently used to treat inflammatory illnesses, enhance circulation, and ease respiratory problems. Because of its warming properties. *Shunthi* (*Zingiber officinale* Roscoe), is also commonly used to herbal formulas, highlighting its function in immune system support and cleansing. It is a multipurpose treatment that embodies the overall ideas of Ayurveda, treating bodily conditions while encouraging a healthy way of life.[1]

One important factor affecting the quality and durability of both pharmaceutical and natural medications is their moisture content. It speaks to a substance's water content, which has a big impact on its effectiveness, durability and general quality.

The term "moisture content" describes how much water is contained in a substance and is usually stated as a percentage of the total weight. Because it affects physical qualities, stability, and characteristics, it is important in many areas, including food science, medicine, and agriculture.

Loss on Drying, or LOD, is a popular analytical method for figuring out a substance's moisture content. It calculates the quantity of moisture and volatile materials lost during the drying process of a sample under predetermined parameters. LOD is the weight differential.[2]

Aim

To determine the moisture content in the crude drug (Shunthi - *Zingiber officinale* Roscoe) sample.

Objective

To measure the amount of moisture present in a crude drug (Shunthi - *Zingiber officinale* Roscoe) sample.

Materials :

1. Crude drug sample - Shunthi (*Zingiber officinale* Roscoe)

Instruments Required

1. Petri dish or Weighing dishes
2. Analytical Balance
3. Hot Air Oven
4. Desiccator
5. Spatula
6. Gloves

7. Pair of tong

Drug procurement :

The crude drug sample was procured from M/S. PARUL AYURVED PHARMACY, LIMDA, TALUKA – WAGHODIYA, DIST. – VADODARA-391760 GUJARAT STATE, INDIA LICENCE NO. GA/1842 and the study was conducted at the Quality Control Lab of Parul Institute of Ayurved.

1. Sample Preparation :
   Clean the petri dish with help of tissue paper and then dry the Petri dish by placing it in the drying oven at 110°C for 30 minutes. Remove the Petri dish with the help of pair of tong and allow it to cool in a desiccator for the period of 15 minutes.

Precautions: Ensure that the sample is homogeneous and representative. If the material is in large chunks, crush it to increase the surface area, facilitating moisture removal.

2. Weighing:
   Accurately weigh the cleaned and dried Petri dish (W1) using an analytical balance. Take the crude drug sample and place a suitable amount (2gm) into Petri dish. Weigh the dish with sample (W2).

Precaution: Ensure the container is dry and clean before weighing. Any residue or moisture will affect the accuracy of the measurement.

Avoid spilling or losing the sample during transfer. Any loss will affect the final moisture content calculation.

3. Drying:
   Place the Petri dish with the crude drug sample in a Hot Air Oven at 110°C for 5-6 hours.
   After drying, remove the sample and cool it in the desiccator for 30 minutes.
   weigh the dish with the dried sample (W3).

Precautions: Ensure the oven temperature is properly controlled to avoid burning or decomposing the sample. Also, use tongs or gloves when handling the hot Petri dish.
Ensure the Petri dish is cooled completely in the desiccator to prevent any weight gain from absorbed moisture during weighing.

4. Repeat drying:
   Place the sample back in the Hot Air Oven and re-dry, then cool it in the desiccator and reweigh.
   Repeat this process until a constant weight (W3) is obtained.

Precautions: Do not leave the sample exposed to air for long periods after drying, as it may reabsorb moisture from the environment.

5. Moisture content Calculation[3]:

Moisture Content (%) = [(W2 - W3) / (W2 - W1)] × 100

Weight values:

Weight of empty Petri dish – 38.803gm (W1)
Weight of Petri dish with Crude drug – 40.805gm (W2)
Weight of crude drug – 2.002gm
Weight after Drying (W3) – At 12:30pm – 40.674gm ___(a)
At 2:30pm – 40.632gm _ (b)
At 4:30pm – 40.628gm ___(c)

Moisture content Calculation:

$$\text{Moisture content (\%)} = \frac{\text{Initial weight (W2) - Final weight (W3)}}{\text{Initial weight (W2) – Weight of empty Petri dish(W1)}} \times 100$$

At 12:30pm,

$$\text{Moisture Content (\%)} = \frac{40.805\text{gm} - 40.674\text{gm}}{40.805\text{gm} - 38.803\text{gm}} \times 100$$

Moisture Content (a) = 6.543%

At 2:30pm,

$$\text{Moisture Content (\%)} = \frac{40.805\text{gm} - 40.632\text{gm}}{40.805\text{gm} - 38.803\text{gm}} \times 100$$

Moisture Content (b)= 8.641%

At 4:30pm,

$$\text{Moisture Content (\%)} = \frac{40.805\text{gm} - 40.628\text{gm}}{40.805\text{gm} - 38.803\text{gm}} \times 100$$

Moisture Content (c)= 8.841%

$$\text{Mean difference} = \frac{6.543 + 8.641 + 8.841}{3}$$

Moisture Content (%) = 8.008%

The determination of moisture content in crude drugs, such as Shunthi (*Zingiber officinale* Roscoe), is a critical factor influencing their quality, stability, and effectiveness. Moisture content plays a critical role in the stability, safety, and physical properties of pharmaceutical products. High moisture levels can cause chemical degradation of active ingredients, promote microbial growth, and alter essential physical characteristics, such as texture and flowability. Additionally, proper moisture control is crucial for maintaining product integrity during storage and transportation, as exposure to humidity can result in clumping or consistency changes, particularly in hygroscopic materials.[9]

1. Stability: High moisture content can lead to chemical degradation of active ingredients, reducing potency and effectiveness. For instance, moisture can facilitate hydrolysis, a reaction that can alter or degrade sensitive compounds.
2. Microbial Growth: Increased moisture creates an ideal environment for the growth of bacteria, fungi, and other microorganisms. This can lead to contamination, compromising safety and efficacy.
3. Physical Properties: The moisture content can influence the physical characteristics of drugs, such as texture, flowability, and compressibility, which are essential in the formulation of tablets and powders.
4. Chemical Reactions: Reaction with water or any other chemicals may lead to Drug degradation.
5. Storage Conditions: Proper moisture control is vital during storage and transportation. Humidity can cause hygroscopic materials to absorb water, leading to clumping or changes in consistency.[8]

Proper storage, packaging, and handling are essential in preventing drug degradation and maintaining the efficacy and safety of pharmaceutical products.

To prevent drug degradation in pharmaceuticals, several key factors should be considered, focusing on protecting the drug from environmental, chemical, and physical influences. These factors include:

1. Proper Storage Conditions: Temperature Control, Humidity Control, Light Protection
2. Use of Appropriate Packaging: Airtight Containers, Blister Packs, Specialized Packaging
3. Protection Against Chemical Degradation: Avoid Oxidation, Prevent Hydrolysis, Maintain pH
4. Minimizing Physical Degradation: Avoid Mechanical Stress, Prevent Crystallization
5. Control of Microbial Contamination: Sterility Maintenance, Use of Sealed Containers
6. Follow Manufacturer's Guidelines: Adherence to Label Instructions, Expiration Date

Figure 1 – Weight of an empty Petri dish (W1)

Figure 2 – Weight of Crude drug

Figure 3 – Weight after drying at 12:30pm

Figure 4 – Weight after drying at 2:30pm

Figure 5 – Weight after drying at 4:30pm

Compliance

7. Use of Additives: Antioxidants, Preservatives
8. Environmental Control in Storage Facilities: Controlled Storage Areas, Regular Monitoring[4]

In this study, the moisture content was measured using the Loss on Drying (LOD) method, a well-established technique in pharmaceutical and natural product analysis. By analyzing the moisture content, one can assess the storage conditions, stability, and shelf life of the product. The process of drying, cooling, and weighing the sample multiple times ensures that the final weight is accurate and that no residual moisture remains, which would affect the quality of the crude drug.

The normal moisture content of powdered drugs typically ranges from 8% to 10%.[7] The moisture content in the sample was determined at different times during the drying process, and the values varied slightly at 12:30 pm, 2:30 pm, and 4:30 pm, indicating a gradual loss of moisture. The final moisture content, calculated to be 8.008%, falls within an acceptable range for dried herbal products. The difference between the initial and final weights indicates that drying was effective, and the minimal difference in the repeated weights reflects the accuracy of the method used. However, slight variations in moisture content over time could suggest environmental factors or potential reabsorption of moisture, even when precautions were taken.

This study successfully measured the moisture content of Shunthi (*Zingiber officinale* Roscoe) using the Loss on Drying method. The final moisture content of 8.008% highlights the effectiveness of the drying process and suggests that the sample was adequately dehydrated to ensure stability and quality. Accurate moisture content determination is an essential in maintaining the therapeutic efficacy of herbal medicines, as excessive moisture can lead to microbial growth or degradation of active compounds. Future studies may focus on exploring different drying techniques or environmental conditions to further optimize the stability of crude drugs like Shunthi (*Zingiber officinale* Roscoe).

References :

1. Available from https://medicaljournalshouse.com/index.php/ADR-Medicinal-Chemistry/article/download/786/584#:~:text=It%20is%20used%20in%20many,secretion%20in%20the%20bile%20duct
2. Available fromhttps://pharmaguddu.com/moisture-content-and-loss-on-drying-lod-pharma/
3. Available fromhttps://www.phytojournal.com/archives?year=2014&vol=3&issue=4&ArticleId=423
4. Available from https://eprajournals.com/IJSR/article/9802/download
5. Modi M, and K. Modi (2024). Ginger Root. [Updated 2024 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK565886/
6. Prof. K. C. Chunekar, (2015). Bhavprakasha Nighantu, Reprint 2015, Chaukhambha Bharati Academy, Haritakyadi Varga, P.12.
7. Singh AK, S Kumar, and SN Tiwari, (2023). *J Ayu Int Med Sci*. *8*(12): 82-86.
8. Thakur L, U Ghodasra, N Patel, and M. Dabhi (2011). *Pharmacogn Rev.* Jan; *5*(9): 48-54. doi: 10.4103/0973-7847.79099. PMID: 22096318; PMCID: PMC3210007.
9. Wang H, Y Chen, L Wang, Q Liu, S Yang, and C. Wang (2023). Advancing herbal medicine: enhancing product quality and safety through robust quality control practices. Front Pharmacol. Sep 25;14:1265178. doi: 10.3389/fphar.2023.1265178. PMID: 37818188; PMCID: PMC10561302.