



## DETERMINATION OF LOSS ON DRYING IN CRUDE DRUG

Mr. Prashant Shinde<sup>1</sup>, Mr. Avinash Chavan <sup>2</sup>, Dr. Lalita Bhagure<sup>3</sup>, Mr. Ganesh Gore<sup>4</sup>

Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna. 431202

<sup>1,4</sup>Student of Bachelor in Pharmacy, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere

<sup>2,3</sup>Department of Pharmacy, Faculty of Pharmacy, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere

### ABSTRACT

Black cardamom (*Amomum subulatum* Roxb.), commonly known as Badi Sanuf, is an important medicinal and aromatic crude drug widely used in traditional medicine, food preparation, and pharmaceutical formulations. It belongs to the family Zingiberaceae and is primarily cultivated in the Himalayan regions of India, Nepal, and Bhutan. The dried fruits of black cardamom possess a characteristic smoky aroma and contain numerous bioactive constituents that contribute to their therapeutic and commercial significance. Due to its extensive use in herbal medicine and the pharmaceutical industry, quality evaluation of black cardamom is essential to ensure its safety, efficacy, stability, and storage life. One of the most important quality-control parameters used in the evaluation of black cardamom and other crude drugs is the determination of Loss on Drying (LOD), which provides information about the moisture and volatile matter content present in the drug material.

Moisture content plays a crucial role in maintaining the quality of crude drugs. Excessive moisture may lead to microbial contamination, fungal growth, enzymatic degradation, and deterioration of active constituents, thereby reducing the medicinal value of the drug. On the other hand, extremely low moisture levels may affect the texture, appearance, and processing characteristics of the material. Therefore, determination of moisture content through Loss on Drying analysis is considered an essential step in the standardization and quality assessment of black cardamom. The test involves measuring the reduction in weight of the sample after drying under controlled temperature conditions until a constant weight is achieved. The observed weight loss generally represents the removal of free water, adsorbed moisture, and certain volatile substances present in the sample.

**KEYWORDS:** Black Cardamom, Crude Drug, Moisture Content, LOD, Pharmacognosy

### INTRODUCTION

Pharmacognosy is the branch of pharmaceutical science that deals with the study of crude drugs obtained from natural sources such as plants, animals, and minerals. These crude drugs are used in their natural form or after minimal processing

for medicinal purposes. They contain a wide variety of biologically active compounds that are responsible for their therapeutic effects. The quality, safety, and efficacy of these crude drugs depend on several factors including cultivation conditions, harvesting time, drying methods, and storage conditions.



Fig No 01. Weight of empty dish



Fig No. 02. Weight of dish + sample(before drying)



Among all quality parameters, moisture content is considered one of the most important factors affecting the stability of crude drugs. Water is naturally present in all plant materials, and even after drying, a certain amount of moisture remains within the drug. This moisture may exist in different forms such as free water, adsorbed water, and bound water. If not properly controlled, excessive moisture can lead to microbial growth, enzymatic degradation, chemical instability, and loss of active constituents. These changes ultimately reduce the medicinal value and shelf life of crude drugs.

#### Pharmacognosy of Black Cardamom

- Botanical Name: *Amomum subulatum* Roxb.
- Family: Zingiberaceae
- Common Name: Badi Elaichi
- Part Used: Dried fruit capsules
- Nature: Aromatic crude drug

#### Uses

- Digestive stimulant
- Expectorant
- Carminative
- Anti-inflammatory
- Antimicrobial

#### Definition of Crude Drug

Crude drugs are natural substances of plant, animal, or mineral origin that are used therapeutically in their original form or after simple processes such as drying, powdering, or extraction. They contain active chemical constituents responsible for pharmacological effects.

#### Examples

- Plant: Ginger, Turmeric
- Animal: Honey
- Mineral: Sulphur

#### Scope of Pharmacognosy

- Identification of medicinal plants
- Collection and cultivation
- Extraction of active constituents
- Quality control
- Standardization
- Herbal drug formulation
- Discovery of new drugs

#### Aim

To determine the Loss on Drying (LOD) of Black Cardamom crude drug.

#### Objective

To estimate the moisture content and evaluate the quality of the crude drug.

#### Principle

The loss on drying (LOD) test is an important method used in pharmacognosy to determine the amount of moisture and volatile matter present in crude drugs. It helps in assessing the

quality, stability, and shelf life of herbal materials. When heated at 105°C, moisture evaporates, resulting in weight loss.

#### Formula

$$\text{LOD (\%)} = (\text{Initial Weight} - \text{Final Weight}) \times 100 / \text{Initial Weight}$$

#### Biological Source

Dried ripe fruits of *Amomum subulatum* Roxb.

#### Chemical Constituents

- 1,8-Cineole
- Limonene
- Sabinene
- Terpineol
- Flavonoids
- Phenolic compounds
- Carbohydrates
- Proteins

#### METHOD OF PREPARATION

##### Harvesting

Black cardamom fruits are harvested when they reach full maturity. The capsules are collected manually from the plant when they turn greenish and fully developed. Proper timing of harvesting is important because immature fruits have low essential oil content, while overripe fruits may lose quality.

##### Cleaning

After harvesting, the fruits are cleaned to remove soil, dust, plant debris, and other impurities. This ensures better quality and prevents contamination during drying.

##### Curing

Freshly harvested fruits undergo curing, which is an essential step in developing their characteristic smoky flavor. In this process:

- ☐ The fruits are exposed to direct heat or smoke from firewood
- ☐ Traditional smoke-curing houses or kilns are used
- ☐ Temperature is maintained in a controlled manner

##### Drying

- ☐ Sun drying (traditional method in some areas)
- ☐ Hot air drying (modern controlled method)
- ☐ Smoke drying (most common method)
- ☐ Moisture is reduced to a safe level

##### Storage

- ☐ Size
- ☐ Color
- ☐ Weight
- ☐ Quality of pods

Good quality capsules are uniform, well-dried, and dark brown in color.

#### Materials Required

##### Apparatus

- Analytical Balance
- Hot Air Oven
- Moisture Dish
- Desiccator



### Sample

Black Cardamom Powder

### Hot Air Oven

A Hot Air Oven is an important laboratory instrument used for dry heat sterilization and drying purposes. It is widely used in pharmaceutical, microbiological, and research laboratories to ensure contamination-free materials and equipment.

### Working Temperature

105°C

### Analytical Balance

An analytical weighing balance is a high-accuracy instrument essential for precise measurement of small quantities in scientific and pharmaceutical laboratories.

### Observation Table

| Sr. No. | Parameter                                | Observation |
|---------|------------------------------------------|-------------|
| 1       | Weight of empty moisture dish            | 25g         |
| 2       | Weight of dish + sample(before drying)   | 35g         |
| 3       | Weight of sample taken                   | 10g         |
| 4       | Weight after 1st drying                  | 33g         |
| 5       | Weight after 2nd drying                  | 32.5g       |
| 6       | Weight after 3rd drying(constant weight) | 32g         |
| 7       | Final constant weight of sample          | 7g          |
| 8       | Loss in weight                           | 3g          |

### Calculation

Initial Weight = 10 g

Final Weight = 7 g

$LOD (\%) = (10 - 7) \times 100 / 10$

$LOD (\%) = 30\%$

### Result

Loss on Drying = 30%

### Interpretation

- Moisture and volatile matter removed successfully.
- Constant weight confirms complete drying.
- Sample quality can be assessed through moisture content.

### Precautions

- Use clean apparatus.
- Maintain temperature at 105°C.
- Avoid overheating.
- Cool in desiccator before weighing.
- Use airtight containers for storage.
- Prevent moisture absorption.

### Importance of LOD

- Quality control
- Standardization
- Shelf-life determination
- Prevention of microbial growth

### Applications

- Herbal drugs

### Features

- Accuracy up to 0.001 g
- Highly sensitive
- Used for pharmaceutical analysis

### Procedure

1. Weigh empty moisture dish.
2. Add 10 g sample.
3. Record initial weight.
4. Dry in hot air oven at 105°C.
5. Cool in desiccator.
6. Weigh again.
7. Repeat until constant weight is obtained.

- Pharmaceutical industry
- Food industry
- Research laboratories

### Classification of Crude Drugs

1. Based on Source
  - ☐ Plant origin (major source)
  - ☐ Animal origin
  - ☐ Mineral origin
2. Based on Morphology
  - ☐ Organized drugs (leaves, bark, roots, seeds)
  - ☐ Unorganized drugs (gums, resins, latex)
3. Based on Chemical Constituents
  - ☐ Alkaloid-containing drugs
  - ☐ Glycoside-containing drugs
  - ☐ Volatile oil-containing drugs

### CONCLUSION

Loss on Drying is an important pharmacognostical parameter used to determine moisture content in crude drugs. Proper moisture control ensures stability, quality, and shelf life. In the present study, Black Cardamom showed a Loss on Drying value of 30%, indicating the amount of moisture and volatile matter removed during drying.

### REFERENCES

1. Razvi, S. Z. A., Kamm, I., Nguyen, T., Pellett, J. D., & Kumar, A. (2021). Loss on Drying Using Halogen Moisture Analyzer: An Orthogonal Technique for Monitoring Volatile Content for In-Process Control Samples during



*Pharmaceutical Manufacturing. Organic Process Research & Development*, 25(2), 300–307.

<https://doi.org/10.1021/acs.oprd.0c00512>

2. Zhdanov, D. A., Braslavskii, V. B., & Kurkin, V. A. (2021). Determination of Infrared Thermogravimetric Moisture (Loss on Drying) for Different Morphological Groups of Medicinal Plant Raw Materials: Development of Techniques. *Aspirantskiy Vestnik Povolzh'ya*, 21(5–6), 73–77. <https://doi.org/10.55531/2072-2354.2021.21.3.73-77>
3. Fadeikina, O. V., Voropaev, A. A., Davydov, D. S., & Volkova, R. A. (2023). Estimation of Measurement Uncertainty for the Determination of Loss on Drying of Biologicals. *Biopreparaty: Prevention, Diagnosis, Treatment*, 23(3-1), 452–462. <https://doi.org/10.30895/2221-996X-2023-23-3-1-452-462>
4. Gangwar, A., Tewari, G., Pande, C., et al. (2024). Effect of Drying Conditions on the Chemical Compositions and Antioxidant Activity of *Hedychium spicatum* Rhizome Essential Oil. *Scientific Reports*, 14, 28568. <https://doi.org/10.1038/s41598-024-79712-5>
5. Bhaveshkumar, A. M., & Banne, S. T. (2026). Moisture Content Determination of Kokilaksha Churna Using Loss on Drying Method: A Quality Control Approach. *The Bioscan*, 21(2), 270–274.