

## Practical Work 2 : **Dehydration of a Fruit**

### **1-Introduction :**

There are several methods for dehydrating produce. Specialized equipment is not strictly necessary; however, several factors can impact which method is most appropriate for your circumstances, including the climate and the types and amounts of food to be dried. Ideal drying conditions include the ability to control temperature within a specific range; low humidity levels; and good air circulation.

The optimal temperature for dehydrating most produce is about 140°F; for herbs the optimal temperature is 95°F-115°F. Drying at too high a temperature will cook, rather than dry, the food. It can also cause **case hardening**, where food develops a hard outer crust that prevents moisture from escaping, resulting in spoilage or a safety hazard. Drying food too slowly may result in mold or other spoilage to occur before dehydration can be completed.

### **2-Methods of Dehydrating**

The following are the various methods that food may be dehydrated at home.

- **Dehydrator:** These electric appliances are considered to provide the highest quality dried food. They heat evenly and quickly, and can be set to ideal temperatures for the product being dehydrated. There are a few styles to choose from; in all cases, we recommend a device with a thermostat and a fan that provides for good air circulation.

Rotating trays in vertical dehydrators (where the heat source and fan are at the top or the bottom of the device) can help ensure even drying. Horizontal dehydrators (with the heat source and fan at the back of the device) have the benefit of providing equal heat treatment to all trays; reducing the mixture of flavors if multiple foods are dried at once; and preventing juices or liquids from dripping down onto a heating element as can happen with vertical dehydrators.

- **Oven:** Home ovens can be used to dehydrate food, however, they must be able to be set to a low temperature (about 140°F, depending on the food). For ovens that can't be set this low, propping the oven door open several inches can help reduce the temperature.

For traditional ovens that do not have a built-in fan, placing a fan outside the propped-open oven door can help provide air circulation. Because the temperature of an oven with a propped-open door can vary, it's recommended to place a thermometer near the food, and adjust the oven's temperature dial as necessary to achieve the needed temp of ~140°F. Food

is more susceptible to scorching at the end of the drying time in an oven, so it's important to monitor it closely.

- **OVEN VS. DEHYDRATOR DRYING**

Ovens consume more energy and can take 2 to 3 times longer than dehydrators to dry food. Oven-dried food is generally darker, more brittle, and less flavorful than that dried in an electric dehydrator

- **Microwave:** Because of the lack of air circulation, fruit and vegetables should not be dried in microwave ovens. These devices are suitable only for small batches of herbs and some leaf vegetables. Microwaves wattages of 1,000 may heat too fast for drying; check the manual for specific operating instructions for drying herbs.

- **Sun Drying:** In this method, produce is exposed to constant direct sunlight over the course of several days. Hot, breezy days are best; to ensure sufficient drying, a minimum temperature of 85°F and humidity less than 60% are needed. Fruits, because of their high acid and sugar content, are safe to dry in the sun. Vegetables are not recommended for sun drying because they are low in acid and sugar, increasing the risk of spoilage.

To dry fruit in the sun, place the fruit on trays made with food-safe screens (such as stainless steel, Teflon-coated fiberglass, or plastic). Do not use "hardware cloth" or copper or aluminum screening. Wood may also be used to make drying trays, however avoid green wood, pine, cedar, oak or redwood, as these woods can warp, stain food, or cause off-flavors. Cover the drying trays with cheesecloth to protect the food from insects and birds. It is best to raise the trays off the ground to improve air flow.

- **Dehydrofreezing:** Combining both drying and freezing techniques (and not to be confused with freeze drying), this method has several benefits over conventionally dehydrated produce: the product has better flavor and color; it takes less time to dry (produce is dried to 30% residual moisture, whereas conventionally dried fruits are dried to 20% and vegetables to 10% residual moisture, respectively); less room is taken up in the freezer because of the partial dehydration; and the products reconstitute in about one-half the time of conventionally dehydrated produce.

- **Freeze Drying:** Using special freeze-drying machines, food is dehydrated using a 3-step method that involves deep freezing, sublimation, and final heating. Home freeze dryers can be relatively expensive and are more expensive to operate compared to typical home dehydrators. However, the benefits of freeze drying (technically known as lyophilization)

include the best quality compared to other types of dehydrating; comparable nutrition compared to raw food; less shrinkage; and a significantly longer shelf life.

### 3-Objective:

- To study the process of **removing water from a fruit**.
- To observe the changes in **weight, texture, and appearance** before and after dehydration.
- To understand the effect of dehydration on **preservation and shelf life**.

### 4-Materials Needed:

- Fresh fruit (apple, banana, or mango)
- Knife and cutting board
- Oven or dehydrator
- Baking sheet and parchment paper
- Lemon juice (optional, to prevent browning)
- Digital scale
- Airtight container
- Notebook for observations

### Procedure:

#### 1. Preparation of Fruit:

- Wash and peel the fruit if necessary.
- Cut the fruit into **uniform slices** (3–6 mm thick).
- Optional: Dip slices in **lemon-water solution** (1 part lemon juice : 3 parts water) for 5 minutes to prevent browning.

#### 2. Weigh the Fruit:

- Measure the **initial weight** of the fruit slices using a digital scale and record it.

#### 3. Arrange for Dehydration:

- Place the fruit slices on a baking sheet lined with **parchment paper**, ensuring slices do **not touch each other**.

#### 4. Dehydrate the Fruit:

##### Option A – Oven Method:

- Preheat oven to **50–60 °C** (120–140 °F).

- Place the tray in the oven, leaving the door slightly ajar for airflow.
- Dehydrate for **4–6 hours**, flipping slices halfway through.

| Slice Thickness   | Oven Temp             | Approx. Drying Time | Texture                |
|-------------------|-----------------------|---------------------|------------------------|
| 3–4 mm            | 50–60 °C (120–140 °F) | 4–6 hours           | Pliable, slightly soft |
| 3–4 mm            | 65–70 °C (150–160 °F) | 2.5–4 hours         | Chewy, slightly crisp  |
| 2 mm (thin chips) | 70–75 °C (160–170 °F) | 1.5–3 hours         | Crispy apple chips     |

#### 5. Check the Drying Progress:

- The fruit should be **dry, slightly pliable, and not sticky**.
- Measure the **final weight** and record it.

#### 6. Observation & Recording:

- Note the changes in **color, texture, and size**.
- Calculate **water loss percentage**:

$$\text{Water loss \%} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

calculate the **moisture content (%)** ?

### Déshydratation d'un fruit

#### Préparation



► Découpe des fruits



► Trempage eau citron



► Pesée initiale

#### Déshydratation

Four à 55°C



Plateau avec tranches de fruits

Papier sulfurisé

4–6 heures



► Pesée finale



► Stockage hermétique

### Questions

1. What is the purpose of dehydrating fruit?

2. How does water content affect the shelf life of apples?
3. Explain why lemon juice is sometimes used before drying fruit.
4. Why should the oven door be left slightly open during drying?
5. How does dehydration prevent microbial growth?

6. If the initial weight of apple slices is 100 g and the final weight after drying is 30 g, calculate the **moisture content (%)**.

7. How would you modify the drying time if the apple slices were **thicker** or **thinner**?