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## EXPERIMENT 2 DETERMINATION OF MOISTURE

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### 2.1 INTRODUCTION

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Moisture content of vegetables and most of their products can be determined by drying the material in an air oven. A fairly high temperature of the order of  $105^{\circ}\text{C}$  is required to remove the bound water in foods. However, at that temperature, foods containing appreciable proportion of sugars like fruit products decompose giving wrong results. Therefore, it is advisable to dry such products at lower temperature, such as  $60\text{-}70^{\circ}\text{C}$ , preferably in a vacuum oven.

#### Objectives

After performing this experiment, you should be able to:

- determine the moisture content of foods by air oven method; and
- determine the moisture content of sugary products by vacuum oven method.

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### 2.2 EXPERIMENT

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#### 2.2.1 Principle

Moisture in foods exists both as free water and bound water. Bound water is more difficult to remove by heat. Therefore, the time required for complete removal of water from a food material varies. Hence drying has to be continued till constant weight is reached.

#### 2.2.2 Requirements

##### Apparatus

Hot air oven (thermostatically controlled)	-1
Vacuum oven	-1
Chemical balance, 1 mg sensitivity	-1
Desiccator (with active desiccant)	-1

Moisture dishes with tight fitting lids

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Aluminium dishes (7 cm. Dia.)  
Sea sand (washed and ignited)  
Glass rods

### 2.2.3 Procedure

#### a) Air oven method

Weigh accurately 5 g of the material in a dish previously dried and weighed. Place the dish along with lid in an electric air oven maintained at 70°C in the case of fruits or their products, or 100°C in the case of vegetables or their products. Cool the dish to room temperature in a desiccator and weigh with the lid on. Repeat the process of heating, cooling and weighing until the loss in weight between two successive weighings do not vary by more than 3-5 mg. For most of the samples 16-18 hr heating is sufficient. Record the lowest weight obtained.

#### b) Vacuum oven method

Place 20-25 g pure sea sand and a short glass rod in an aluminium dish having a tight fitting cover. Dry thoroughly and cool in a desiccator and weigh. Accurately weigh 5 g sample and transfer completely to the dish by rinsing with water. Mix well with the glass rod and heat on steam bath for partial drying. Transfer the dish to vacuum oven and dry the sample at 70°C at a pressure not more than 100 mm Hg pressure. Cool in a desiccator and weigh. Repeat the process of drying, cooling and weighing until consecutive weighings made at intervals do not vary by more than 3 mg. Drying for 6 to 7 hr is generally found sufficient.

### 2.2.4 Observations

#### a) Air oven method

Weight of the weighing dish with lid =  $W_1$  = ----- g

Weight of the dish with lid and material =  $W_2$  = ----- g

Weight of the dish with lid and dried material =  $W_3$  = ----- g

#### b) Vacuum oven method

Weight of the dish with sand and glass rod =  $W_1$  = ----- g

Weight of the dish with glass rod and material =  $W_2$  = ----- g

Weight of the dish with glass rod and dried material =  $W_3$  = ----- g

### 2.2.5 Calculations

#### a) Air oven method

Weight of the material = (Weight of the dish with sample – weight of the dish)

$$= (W_2 - W_1) = \text{----- g}$$

$$\begin{aligned} \text{Quantity of moisture in the material} &= (\text{Weight of the material before drying} - \\ &\quad \text{weight of the material after drying}) \\ &= (W_2 - W_3) = \text{----- g} \end{aligned}$$

$$\begin{aligned} \text{Per cent moisture in the material} &= \frac{\text{Quantity of moisture in the material}}{\text{Weight of the material}} \times 100 \end{aligned}$$

$$= \frac{(W_2 - W_3)}{(W_2 - W_1)} \times 100 = \text{g/100g or \%}$$

#### b) Vacuum oven method

$$\text{Weight of the material} = W_2 - W_1 = \text{----- g}$$

$$\text{Quantity of moisture in the material} = W_2 - W_3 = \text{----- g}$$

$$\begin{aligned} \text{Per cent moisture in the material} &= \frac{\text{Quantity of moisture in the material}}{\text{Weight of the material}} \times 100 \end{aligned}$$

$$= \frac{(W_2 - W_3)}{(W_2 - W_1)} \times 100 = \text{g/100g}$$

#### 2.2.6 Results

$$\text{Moisture content of the sample} = \text{----- Percent (\%)} \text{ by weight}$$

### 2.3 PRECAUTIONS

The general precautions mentioned in the course 'Introduction' and those indicated in the experiments should be followed meticulously.