EXPERIMENT 1 EQUILIBRIUM MOISTURE CONTENT (EMC)

Structure

1.1 INTRODUCTION

Food materials tend to absorb or lose moisture according to the environmental conditions. They will absorb moisture when partial vapour pressure of the water inside the grain is less than the partial vapour pressure of water present in environment and *vice versa*. The moisture content at the time when equilibrium is achieved by absorbing or losing moisture for specific temperature and relative humidity conditions is known as "Equilibrium Moisture Content (EMC)". The EMC plays significant role in drying and storage of food grains as well as dried fruit and vegetable products.

Objective

After studying and performing this experiment, you should be able to:

- determine the EMC (w.b.) of foods.

1.2 EXPERIMENT

1.2.1 Principle

When a moist food product is placed in a gaseous atmosphere containing water vapour, heat and water vapour exchanges occur between the two phases. The food absorbs or loses water to the atmosphere until a state of thermodynamic equilibrium is reached. Temperature and pressure are then constant and equal in both phases. The moisture achieved in this condition is EMC. In this experiment constant temperature is achieved using incubators and constant water vapour pressure of environment (relative humidity) at particular temperature is achieved using saturated salt solutions. The study is done in closed chamber in order to achieve constant relative humidity.

1.2.2 Requirements (Equipment/Machinery/ Instrument and Chemicals/ Material)

- Hot air oven
- Moisture boxes
- Analytical balance (Least count 0.001 g)
- Desiccators

- Incubators
- Salts (NaCl, K_2CO_3, etc.), as per required humidity conditions

1.2.3 Procedure

- Set the incubator at a particular temperature.
- Place saturated salt solution, (particular salt which maintains a constant relative humidity at specific temperature), in the desiccators.

Table 1.1: Equilibrium relative humidities for some saturated salt solutions

Chemical	Relative humidity %		
	22·8ºC	30ºC	37.8ºC
Sodium chloride	75.5	75.2	75.1
Sodium nitrite	64.8	63.3	61.8
Sodium dichromate	54.1	52.0	50.0
Potassium carbonate	43.9	43.5	43.4
Magnesium chloride	32.9	32.4	31.9

- Accurately measure moisture content of the test sample by drying in an hot air oven. Then keep the sample in Petri dishes, transfer the Petri dishes into desiccators, close the lid and keep the desiccators inside the incubator.
- Accurately weigh samples after 15 days, daily and observe the increase or decrease in weight till it becomes constant.

1.2.4 Observations

Parameters	16 day	17 day	18 day	19 day	20 day
Weight of Petri dish + equilibrated sample (w3)					

Let weight of empty Petri dish was (w1), weight of Petri dish + sample was w2, initially. Based on moisture content of initial sample, the weight of water present in the sample was W4, and then EMC will be given as

$$\text{EMC} = \frac{\text{Weight of sample after equilibration} - \text{Dry matter content of sample}}{\text{Weight of sample after equilibration}} \times 100$$

$$= \frac{(w3 - w1) - (w2 - w1 - W4)}{(w3 - w1)} \times 100$$

1.2.5 Results

Calculate EMC using above formula. The results are always displayed along with temperature and relative humidity.

1.3 PRECAUTIONS

- Never touch the sample or Petri dishes with wet hands.
- The Petri dishes should be dried before placing the samples.
- Sample should be evenly distributed inside the moisture boxes in a single layer.
- The Petri dishes should not come in contact with salt solutions.