

Topic: Scientific Study of Foods

Tests and Experiments on Food Nutrients e.g Protein, Carbohydrates, fats and oil e.t.c.

Introduction

Food is any edible material, usually of plant or animal origin, that contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals, and is ingested and assimilated by an organism to produce energy, stimulate growth, and maintain life or life processes.

CHARACTERISTICS OF FOOD STORAGE

The various food nutrients differ from each other in their: -

1. **Physical properties:** These include their structural appearances and it may change when it is treated in certain ways.
2. **Chemical properties:** These include the chemical compositions of the nutrients. A **chemical property** is any of a material's **properties** that becomes evident during a **chemical** reaction; that is, any quality that can be established only by changing a substance's **chemical** identity. Or the behaviour of a substance when it undergoes chemical change or reaction.

CHARACTERISTICS OF PROTEIN

1. Proteins are made up of carbon, hydrogen and nitrogen
2. The elements arrange themselves in different combinations to form amino acids.
3. Proteins are digested by enzymes called protease
4. Most proteins are insoluble in water
5. Many proteins are coagulated by heat
6. Proteins are not easily destroyed by heat

EFFECT OF HEAT ON PROTEIN

The effect of most heat on protein is known as coagulation. The effect of dry heat on protein causes it to shrink, harden the outer part of the meat and seals in the juices.

TEST FOR PROTEINS

1. **Million's test:** Place 2-3g of egg white in a test tube, add about 4ml of water and shake, then add 2.5mls of million's reagent, observe a white precipitate that forms. Place the

test tube in a beaker that is half filled with water, heat the water slowly, the precipitate turns **red**, indicating the presence of protein.

2. Biuret test: Place a small quantity of egg whit in a test tube and mix with a few drops of water. Add about 1cm³ of dilute caustic soda (NaOH), mixed well. Drop by drop add 1% copper (II) sulphate solution, shake well after each drop. A **purple** or **violet** colour indicates the presence of protein.

CHARACTERISTICS OF CARBOHYDRATES

1. The elements that make up carbohydrate are carbon, hydrogen and oxygen
2. These elements combine in different ways to form (a) simple sugars e.g glucose (b) complex sugars e.g lactose (c) starches e.g yam (d) cellulose found in vegetables
3. All sugars are sweet
4. Sugars are soluble in water
5. Starches are often stored as starch grains in plant cells.
6. The last products of carbohydrate digestion is glucose

EFFECTS OF HEAT ON CARBOHYDRATE

- The effect of dry heat on sugar:- A brown honey like substance is formed. This is called **Caramel**. This process of production of caramel is known as **Caramelization**.
- The effect of moist heat on sugar forms a syrup.
- The effect of dry heat on starch- A light brown colour will be observed. The product is called **Dextrin**. The process is known as **Dexterinization**.
- The effect of moist heat on starch - The starch will swell and a jelly substance is formed. The process is called **Gelatinization**

TEST FOR SIMPLE SUGAR

1. Fehling's test:- Place 6ml of 6% sugar solution in a test tube. Add 6mls of Fehling's solution into the sugar solution, place the tube into a beaker half filled with water, heat the beaker gently to boil. An **orange** or **brick red** precipitate is formed, this shows the presence of a simple sugar.
2. Benedict's test: Place about 6ml of 6% sugar solution in a test tube, add equal quantities of benedict's solution, boil as it is done with the Fehling's test, allow to stand. A **red**, **orange** or **yellow** precipitate is formed.

TEST FOR STARCH

Cut a thin slice of yam or potato, drop 1-2 drops of dilute iodine solution on the cut slice of yam. The yam turns **blue-black** in color. This shows the presence of starch.

CHARACTERISTICS OF FATS AND OIL

1. They contain high proportion of carbon and hydrogen but very little oxygen
2. They are bad conductors of heat
3. Fats and oils are insoluble in water but soluble in ether
4. They are broken down into fatty acids and glycerol
5. Fats are solids at room temperature, oils are liquid at room temperature
6. When fats and oils are exposed to air for prolonged period they become rancid

TEST FOR FATS AND OIL

1. The grease spot test:- Rub a little palm oil on a blotting paper, hold up the paper. A translucent patch is formed by the oil mark and shining patch is observed in the place stained by the oil.
2. Sudan III test:- Place a small quantity of groundnut paste in a test tube, add a few drops of sudan III solution. A distinct **red** coloration is produced.