EXPERIMENT

Aim

To test the presence of oil or fat in the given food sample.

Theory

Oils and fats are triesters of glycerol with higher fatty acids. Triglycerides with higher proportion of unsaturated fatty acids are liquid at ordinary temperature and are called oils.

Material Required

Test tubes, burner, paper, beaker, water bath, Chloroform, ethyl alcohol, $KHSO_4$ crystals, furfural solution, Huble's solution, mustard oil or ghee, lineseed and cotton seed oil.

Procedure

1. Solubility Test

This test is based on the fact that oils and fats are soluble in organic solvents like chloroform, alcohol, etc., but are insoluble in water. We can check the solubility of fats and oils by dissolving them water and organic solvents.

2. Translucent Spot Test

Press a little of the substance in the folds of the filter paper. On unfolding the filter paper, the appearance of translucent or greasy spot on the filter paper indicates the presence of fat or oil. The spot grows larger on heating and drying the filter paper.

3. Acrolein Test

Oils and fats hydrolised to form glycerol and fatty acids then glycerol reacts with $KHSO_4$ and dehydrates to give a pungent smelling compound acrolein.

$$\text{Oil or fat} \xrightarrow{\Delta} \text{Glycerol} + \text{Fatty acid} \qquad \underset{\text{Glycerol}}{\overset{\begin{array}{l}CH_2OH\\ |\\ CHOH\\ |\\ CH_2OH\end{array}}{}} \xrightarrow[\Delta]{KHSO_4} \underset{\text{Acrolein}}{\overset{\begin{array}{l}CH_2\\ ||\\ CH\\ |\\ CHO\end{array}}{}} + 2H_2O$$

4. Huble's Test

This test is used to detect the degree of unsaturation in the given sample of oil or fat and for this purpose, Huble's reagent is used. Huble's reagent is an equimolar mixture of 7% $HgCl_2$ and 5% solution of iodine in 96% alcohol.

For this test take two test tubes, label them as I and II. Put in each test tube 3 ml of chloroform. Add 3-4 drops of cotton seed oil in test tube no. I and linseed oil in test-tube II. Shake and add 3 drops of Huble's reagent in each test tube and observe the fading of violet colour in test tubes. The violet colour of iodine fades away in test tube II, while, violet colour in test-tube I do not fade away. This indicates that linseed oil is more unsaturated than cotton seed oil.

Observations

Table.2.

S. No.	Experiment	Observation	Inference
1.	**Solubility test** (i) Water (5 ml) +oil sample (ii)Chloroform (5 ml) +oil sample	Sample is immiscible. Sample is miscible	Oil or fat present. Oil or fat is present in a given sample.
2.	**Acrolein Test** Oil sample(3ml) + $KHSO_4$ (0.5 g) +heat.	Pungent irritating smell of acrolein is observed.	Pungent irritating odour of acrolein confirms the presence of oil or fat.
3.	**Translucent Spot Test** Press a little of the substance in the folds of the filter paper.	Translucent or greasy spot on the filter paper indicates the presence of fat or oil.	The spot grows larger on heating and drying the filter paper.
4.	**Hubble's Test** **Test tube A:** Cotton seed oil (1ml) +3-4 drops of Huble's reagent. **Test tube B**: Linseed oil (1 ml) +3-4 drops of Huble's reagent.	No fading of violet colour in test tube A. Fading of violet colour in test tube B.	Line seed oil is more unsaturated than cotton seed oil.

Result

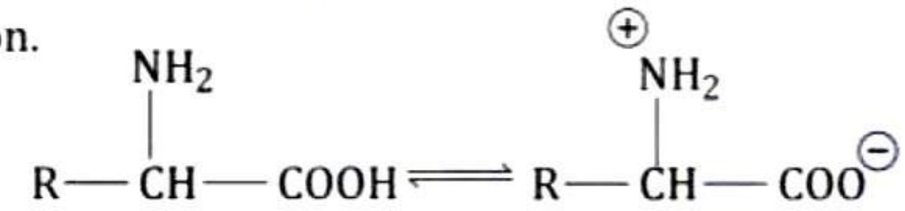
The given pure sample contains fats and oils.

Precautions

1. Do not inhale the vapours of acrolein.
2. Oils and fats are highly flammable, so heating should be done on water bath and do not heat on direct flame.

Proteins

Proteins are high molecular mass complex biomolecules made up of amino acids and are present in all living cells. Transfer of protein from carboxylic acid group to amino group within the molecule results in a dipolar ion called Zwitter ion.

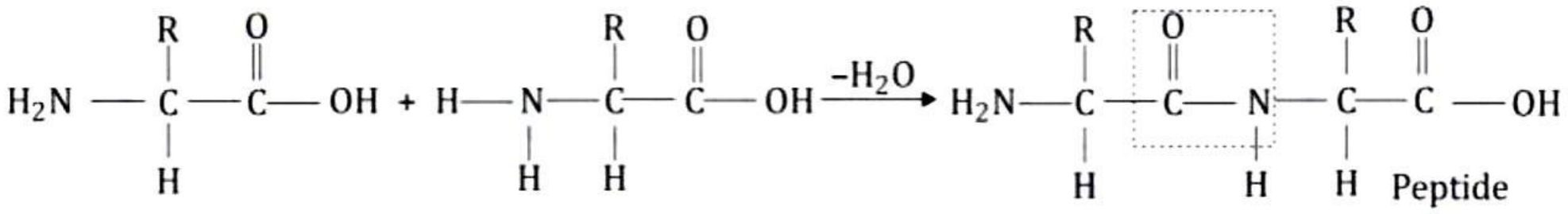


Zwitter ion (dipolar)

Many amino acids join in a specific sequence to form proteins. Proteins are vital for the growth and maintenance of life. Examples of some common proteins are keratin (present in hair and nails), collagen (in tendons), hemoglobin (in blood), and all enzymes and hormones.

$$\text{Proteins} \xrightarrow{\text{Hydrolysis}} \text{Peptides} \xrightarrow{\text{Hydrolysis}} \alpha\text{-amino acids}$$

A peptide is a condensation product of amino acids in which the amino group of one acid is united with the carboxylic group of another amino acid forming a peptide bond .



Amino acid Amino acid (Peptide bond)

VIVA VOCE

Q 1. What is the primary chemical composition of fats or oils?

Ans. Fats and oils are primarily composed of triglycerides, which consist of glycerol and fatty acids.

Q 2. Explain the principle behind the paper or brown paper test for detecting the presence of fats or oils.

Ans. The paper test relies on the translucent or grease spot left on the paper when it comes into contact with fats or oils. This occurs because fats make paper more transparent.

Q 3. Describe the procedure for performing the brown paper test for fats.

Ans. The brown paper test involves placing a small amount of the food sample on a brown paper bag or sheet, pressing it, and observing any translucent spots that appear, indicating the presence of fats.

Q 4. Can you name some common sources of dietary fats and oils?

Ans. Common sources of fats and oils include olive oil, butter, nuts, avocados, and fatty fish.

Q 5. How does the emulsion test work to detect the presence of fats?

Ans. The emulsion test involves shaking the food sample with ethanol and water. If a milky emulsion forms, it indicates the presence of fats.

Q 6. Why is it important to include fats in the diet, despite their detection in some health tests?

Ans. Fats are essential for various bodily functions, including energy storage, absorption of fat-soluble vitamins, and the formation of cell membranes.

Q 7. What role do lipases play in the digestion of fats in the human body?

Ans. Lipases are enzymes that break down fats into glycerol and fatty acids during the process of digestion.

Q 8. What reagent is commonly used to test for the presence of oil or fat in a food sample?

Ans. Sudan III or Sudan IV is commonly used to test for the presence of lipids, including oils and fats, in a food sample.

Q 9. Describe the principle behind the Sudan III test for oils and fats.

Ans. Sudan III is a fat-soluble dye that selectively stains lipids. When mixed with a sample containing oils or fats, Sudan III binds to the lipid molecules, causing them to appear as red-orange droplets or layers.

Q 10. How does the Sudan III test distinguish between oils and fats and other components in the food sample?

Ans. Sudan III specifically stains lipids, while other components in the food sample do not bind to the dye, allowing for the selective detection of oils and fats.

Q 11. What color change indicates a positive result in the Sudan III test?

Ans. A positive result is indicated by the appearance of red-orange droplets or layers in the test solution, indicating the presence of oils or fats.

Q 12. Can the Sudan III test quantify the amount of oil or fat present in the sample?

Ans. No, the Sudan III test is qualitative and only indicates the presence or absence of oils or fats. It does not provide information about the quantity of lipids present.