BHARATHIDASAN UNIVERSITY

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Programme: M.Sc., Biochemistry

Course Title: DETECTION METHODS OF FOOD ADULTERATION

Course Code : BC002VAC

Unit-II

ADULTERATION OF GHEE

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INTRODUCTION

Test For Vegetable Fat

- Fats and oils are an essential part of food products, classified as vegetable fats or animal fats based on their source.
- Vegetable fats are derived from plant-based materials like seeds (e.g., sunflower, sesame), nuts (e.g., coconut, palm), and fruits (e.g., olives, avocado).
- These fats are primarily triglycerides and serve critical functions such as providing energy, enhancing flavor, and acting as carriers for fat-soluble vitamins (A, D, E, and K).
- Testing for vegetable fats is crucial for ensuring the quality, authenticity, and suitability of these fats in food, medicine, and industry.
- Employing accurate and reliable testing methods promotes consumer safety and supports regulatory compliance.

- **Definition and Sources of Vegetable Fats:**

  Examples: Coconut oil, olive oil, soybean oil.

- **Composition:**

  Mainly triglycerides, with varying levels of saturated and unsaturated fatty acids.

- **Importance of Testing:**

  Purity, quality control, and compliance with health standards.

- **Common Tests for Vegetable Fat:**

- **Qualitative Tests**:

  - **Solubility Test**: Demonstrates solubility in organic solvents.
  - **Grease Spot Test**: Identifies fats by leaving translucent spots on paper.
  - **Sudan III Test**: Stains fats red for visual identification.

•**Chemical Tests**:

•**Saponification Test**: Confirms fats by soap formation with alkali.
•**Acrolein Test**: Detects fat by the pungent smell of acrolein on heating.

•**Advanced Methods**:

•Chromatography (GC-MS) and spectroscopy for precise fat analysis.

•**Applications of Vegetable Fat Testing:**

Food safety, pharmaceutical formulations, cosmetic product quality, and research in nutritional science

. NITRIC ACID TEST:

Purpose: To differentiate between animal fats and vegetable fats.

Principle: When mixed with nitric acid, vegetable fats produce a specific color change due to the reaction of unsaturated fatty acids with the acid.

Procedure:

Add 1 mL of concentrated nitric acid to 5 mL of the fat sample in a test tube.
Shake the mixture well.
Observe any color change.
Result:Vegetable fats: Develop a yellow to orange color

- ## Soda Ash Test
- **Purpose: To detect adulteration of vegetable fat with wax or paraffin.**
- **Principle: Soda ash reacts with fatty acids in true fats but does not react with wax or paraffin.**
- **Procedure:**
  - ***Mix 5 g of the fat sample with 5 mL of a 10% soda ash solution.***
  - ***Heat the mixture gently for 2–3 minutes.***
  - ***Observe the solution.***
- **Result:**
  - ***Pure vegetable fat: Produces a uniform soap-like mixture.***
  - ***Adulterated fat (with wax or paraffin): A separate waxy or oily layer forms.***
  - **Valenta Test**
  - ***Purpose: To determine the solubility of vegetable fats in glacial acetic acid, used for identifying oils.***
  - ***Principle: Vegetable oils dissolve in glacial acetic acid at different temperatures depending on their composition.***
  - ***Procedure:***
  - ***Mix 5 mL of the oil sample with 5 mL of glacial acetic acid in a test tube.***
  - ***Cool the mixture gradually and note the temperature at which turbidity appears.***
  - ***Result:***
  - ***The temperature of turbidity helps distinguish between different vegetable oils.***

Test for Added Alkali: Baudouin Test

This presentation delves into the Baudouin test, a crucial analytical method used to detect the presence of added alkali in oils and fats. The detection of added alkali is paramount in ensuring food quality and safety, as it can indicate adulteration or processing irregularities that compromise the product's integrity and potentially affect consumer health. The Baudouin test offers a reliable and relatively straightforward procedure for identifying such adulteration, playing a significant role in quality control within the food industry.

Reagents and Procedure

1

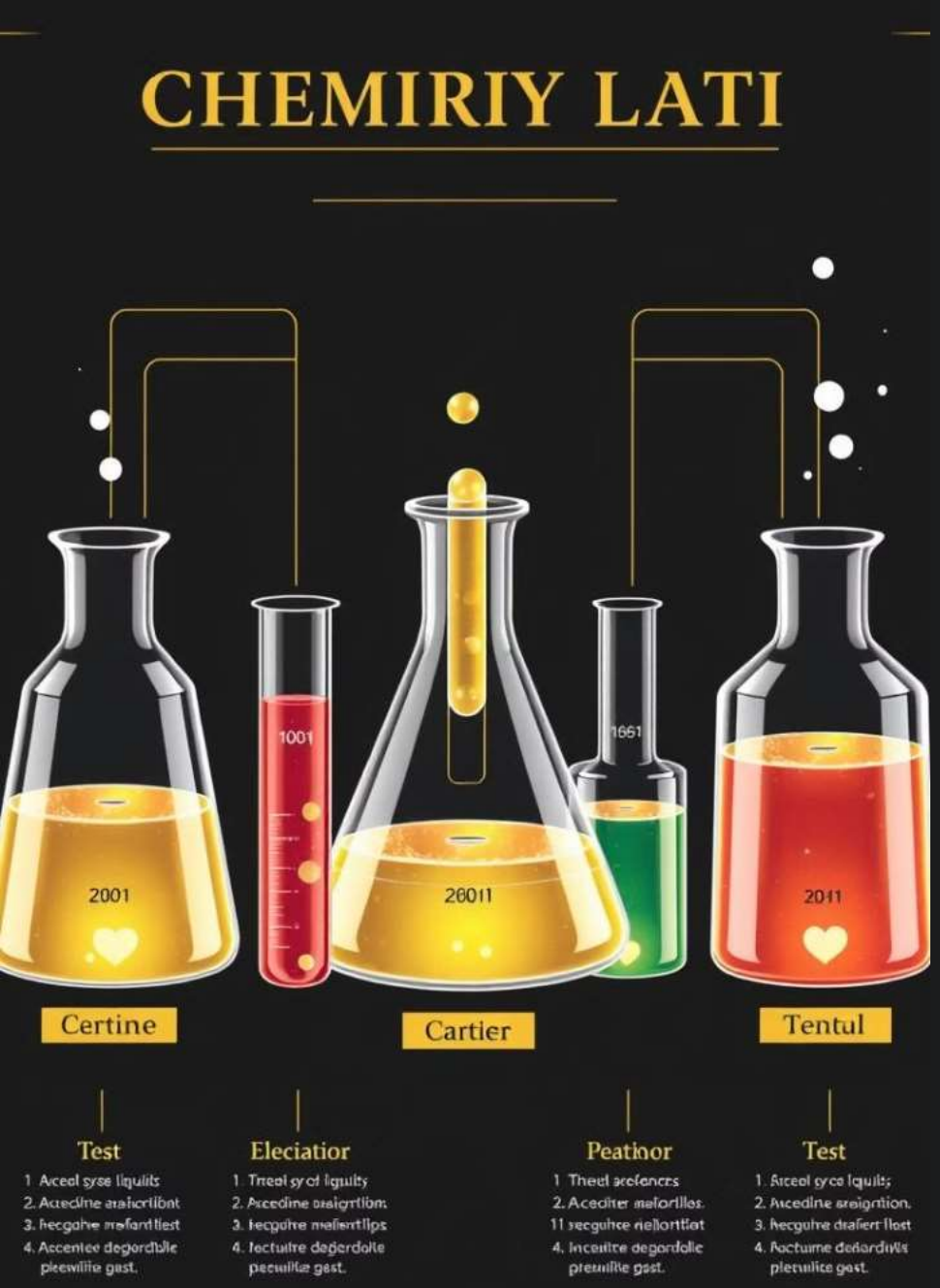
Reagents

Hydrochloric acid, furfural, and the oil sample are needed for the test.

2

Procedure

A few drops of furfural are added to a small amount of the oil sample, followed by hydrochloric acid, and the mixture is observed for color change.



Comparison to Other Adulterant Tests

Halphen Test

Detects cottonseed oil adulteration through a specific color reaction.

Bellier Test

Identifies the presence of peanut oil based on the formation of a precipitate.

Kreis Test

Detects rancidity in fats and oils through a color change reaction.

INTRODUCTION

- **Vegetable Shortening**

Dalda is a type of vegetable shortening primarily made from hydrogenated vegetable oil.

It's commonly used in cooking and baking for its solid consistency and ability to withstand high temperatures.

The hydrogenation process involves adding hydrogen to liquid unsaturated fats, converting them into solid saturated or partially saturated fats.

This process changes the chemical structure and properties of the oil, making it more stable and suitable for various culinary applications.

Concerns About Health

The process of hydrogenation creates trans fats, which are linked to negative health effects like increased LDL cholesterol ("bad" cholesterol) and an elevated risk of heart disease.

Trans fats are particularly harmful because they raise LDL cholesterol while simultaneously lowering HDL cholesterol ("good" cholesterol).

Dalda, being a significant source of trans fats, has faced increasing scrutiny from health organizations and consumers concerned about its potential impact on cardiovascular health.

Consuming foods high in trans fats increases the risk of developing numerous health issues, including obesity, type 2 diabetes, and certain types of cancer.

Methodology for Dalda Testing

- **Sample Collection**

  Collect butter samples from various sources (manufacturers, batches). Ensure sufficient quantity for accurate testing and label samples for traceability. Proper refrigeration is essential for sample integrity.

- **Lipid Extraction**

  Extract lipids using Soxhlet or Bligh-Dyer methods. Employ appropriate solvents (e.g., chloroform-methanol) for efficient fat and oil dissolution. Control parameters for optimal extraction and minimal sample degradation.

- **Chromatographic Analysis**

  Use gas chromatography (GC) to separate and quantify fatty acids. Analyze the chromatogram for trans fatty acids indicative of Dalda. Internal standards ensure accurate quantification.

- **Interpreting the Results**

  Analyze the chromatogram for trans fatty acids. Compare concentrations to standards to determine Dalda presence. Report findings clearly for informed decisions.

Step 1: Sample Collection

Random Sampling

Samples are collected randomly to ensure representativeness of the overall butter population. This minimizes bias and improves the accuracy of the analysis.

- **Proper Labeling**

Each sample is meticulously labeled with details like brand, source, and collection date. This allows for proper identification and tracking during the analysis.

Refrigerated Storage

Collected samples are immediately refrigerated to maintain their integrity and prevent degradation. This ensures accurate results and minimizes the risk of contamination.

Step 2: Lipid Extraction

- **Solvent Extraction**

Butter samples are treated with a suitable solvent, such as chloroform or diethyl ether, to dissolve the lipids. This process removes any unwanted water or other components.

- **Filtration**

The mixture is then filtered to separate the extracted lipids from any remaining solid residues. This ensures a clean and pure lipid extract for analysis.

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Step 3: Chromatographic Analysis

- **Gas Chromatography**

The lipid extract is injected into a gas chromatograph, where it is vaporized and passed through a column.

- **Separation by Boiling Point**

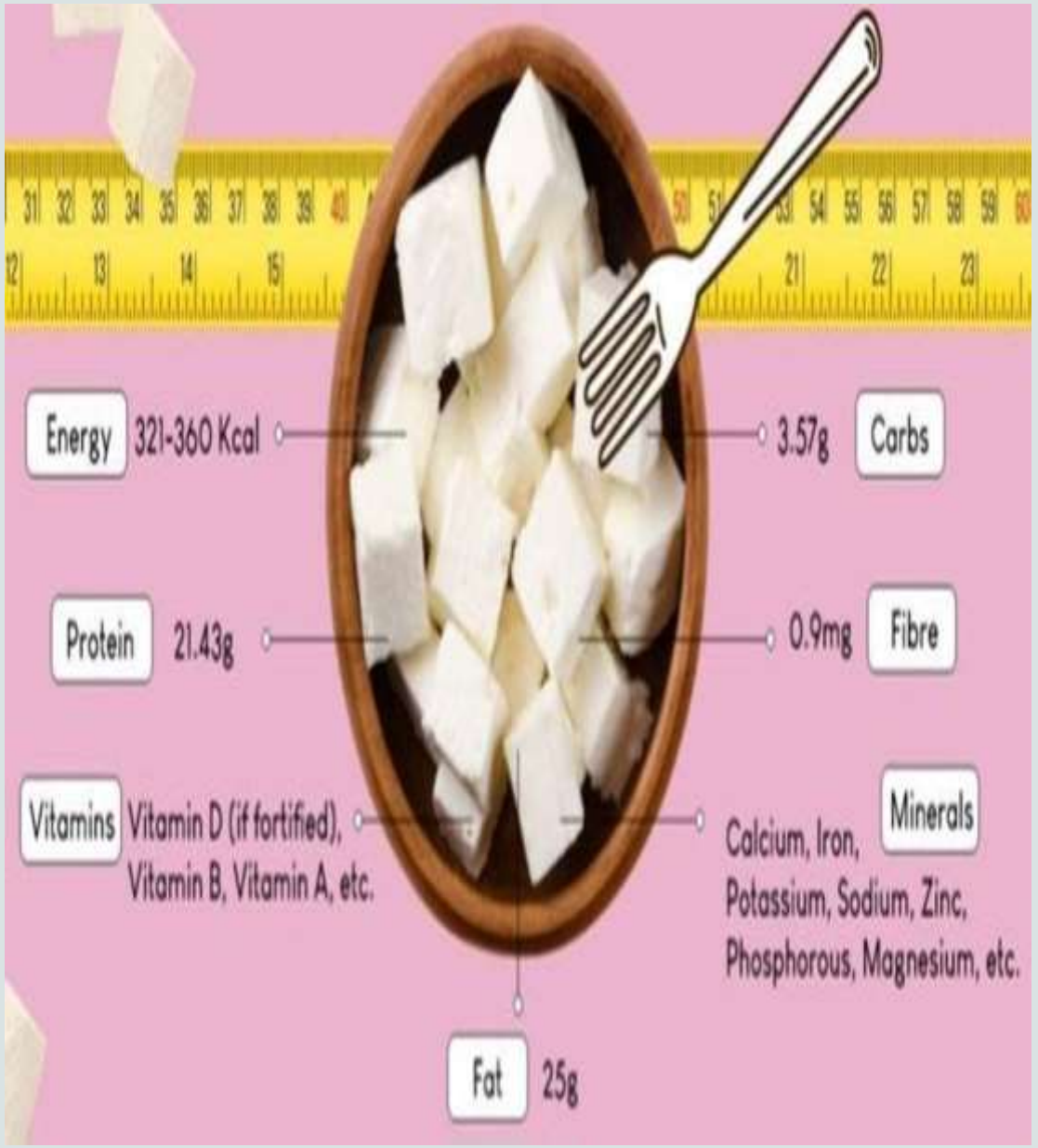
Different fatty acids in the lipid extract are separated based on their boiling points. This allows for identification and quantification of individual fatty acids.

- **Detection**

A detector at the end of the column measures the amount of each fatty acid as it elutes from the column, creating a chromatogram.

PANEER

- **DEFINITION AS PER FOOD SAFETY & STANDARDS ACT 2006**
- Paneer means the product obtained from the cow or buffalo milk or a combination thereof by precipitation with sour milk ,lactic acid ,or citric acid.It shall not contain more than 70% moisture and milk fat content shall not be less than 50% of the dry matter.
- Paneer is a heat -acid coagulated milk product obtained by coagulation standardized milk with the permitted acids at specified temperature.
- The resultant coagulum is filtered and pressed to get the sliceable curd mass . paneer has a firm ,close, cohesive and spongy body and smooth texture.
- Paneer is generally solid as blocks or slices , it is also referred as indian fresh cheese .



ADULTERATION OF PANEER

PRESENCE OF STARCH IN PANEER ...

However,some commercial paneer products may contain added starches as fillers or texture modifiers.

REASONS FOR STARCH PRESENCE:

Texture modification: starch can help improve the Texture of paneer,making it more firm or crumbly.
Moisture control:starch can absorb excess moisture, extending the shelf life of paneer.
Cost reduction: Adding starch can reduce the overall cost of production.

DETECTION METHOD

- **Iodine test** :A simple and commonly used method. Iodine solution turns blue-black in the presence of starch.
- **Chlorine water test:**chlorine water reacts with starch to produce a yellowish color.
- **High-performance liquid chromatography (HPLC):**A more advanced method for detecting and quantifying starch.