

Butter and Margarine Texture Analysis

Understanding the texture of butter and margarine is essential for optimizing their spreadability, mouthfeel, and performance in various culinary applications. Key textural properties such as hardness, graininess, and oiliness affect product quality and consumer preferences, influencing both processing conditions and end-use performance.

Test Principle:

Evaluation of the cutting force of butter and margarine using a wire cutter to measure hardness and work done.



Background:

Texture Characteristics:

- Properties like hardness, spreadability, graininess, brittleness, oiliness, and stickiness are determined using the CTX Texture Analyzer.
- Texture varies based on temperature, origin of the milk or oil, and fat content.

Temperature Effects: Alters fat consistency, affecting glyceride distribution and fat crystal size; larger crystals increase hardness and graininess.

Origin and Fat Content: Influence texture by determining fat types (saturated or unsaturated); higher fat content results in higher hardness and lower spreadability.

Equipment:

- Instrument: CTX with 5 kg Load Cell
- Probe: Wire Shear Plate (TA-WSP)
- Fixture: Fixture Base Table (TA-BT-KIT)
- Software: Texture Pro Software

Settings:

- Test Type: Compression
- Speeds: Pre-test: 1.0 mm/s; Test: 0.5 mm/s; Post-test: 0.5 mm/s
- Target Distance: 35 mm
- Trigger Force: 30 g



Sample Preparation:

Cut samples into equal-sized rectangles or squares and allow them to stabilize at the same temperature before testing.

Procedure:

1. Attach the wire cutter probe to the instrument.
2. Secure the fixture base table to the instrument and tighten the thumb screws.
3. Insert the wire cutter base plate and align it with the wire cutter probe.
4. Tighten the thumb screws of the fixture base table to prevent movement.
5. Remove the sample from storage and place it on the fixture base table.
6. Align the sample centrally under the wire cutter.
7. Position the wire cutter close to the sample.
8. Start the test.

Observations:

Figure I: Shows the cutting force required to slice a 5 cm x 3 cm block of butter and margarine at room temperature. The maximum peak represents the hardness, and the area under the load vs. time graph indicates the hardness work done.

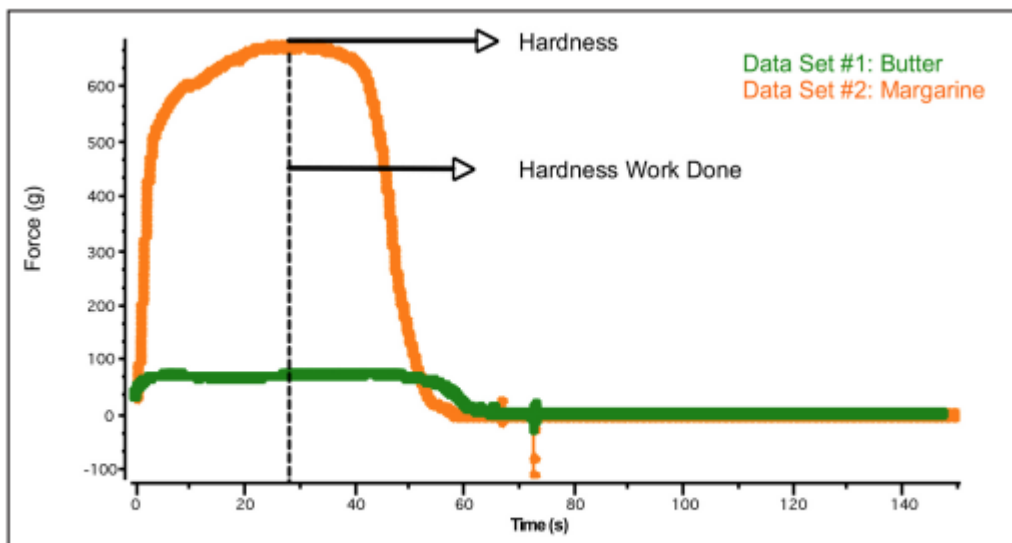


Figure I

Figure II: Illustrates force versus distance for the cutting force, confirming butter's higher firmness compared to margarine.

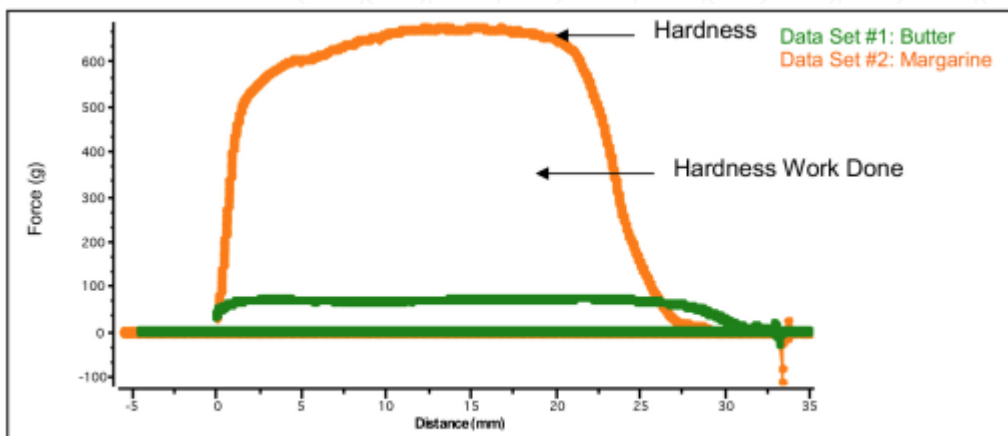


Figure II

Results:

Cutting Force Hardness:

Butter: 679.5 g

Margarine: 73 g

Work Done:

Butter: 145.27 mJ

Margarine: 19.46 mJ

Cutting Force	Hardness (g)	Work Done (mJ)
Butter	679.5	145.27
Margarine	73	19.46

Discussion:

Upon reaching a trigger force of 30 g, the wire cutter penetrates the sample over 35 mm. The graph slope increases until it reaches a plateau, indicating the maximum force needed to cut through the sample. A higher plateau value corresponds to a firmer sample, confirming that butter is significantly firmer than margarine.