

Bean Texture Analysis

Understanding the hardness of cooked beans is essential for optimizing cooking times and ensuring consistent texture, which affects consumer satisfaction and product quality. Proper hardness measurement allows for better quality control and standardization in food processing.

Test Principle:

- Evaluate the hardness of dry cooked beans using bulk compression with a plunger to measure the force required to cause sample failure.

Background:

- The compression test measures the maximum force needed to fracture the beans, characterizing their hardness. The area under the force vs. deformation curve represents the energy required to crush the sample.



Equipment:

- Instrument: CTX Texture Analyzer with a 50 kg load cell
- Accessories: Fixture Base Table (TA-BT-KIT), Ottawa Cell (TA-OC), Extrusion Plate, Catchment Drawer
- Software: Texture Pro

Settings:

- Test Type: Compression
- Pre-Test Speed: 2.0 mm/s
- Test Speed: 2.0 mm/s
- Target Type: Distance
- Target Value: 10 mm
- Trigger Force: 50 g

Sample Preparation:

- Weigh 30 g of beans and pour them into the Ottawa cell, filling approximately 50% of the cell.

Procedure:

1. Attach the plunger to the instrument.
2. Secure the Ottawa cell onto the base table.
3. Align the plunger with the Ottawa cell to ensure it does not touch the edges.
4. Place a catchment drawer beneath the Ottawa cell.
5. Add the sample to the Ottawa cell, ensuring a level surface.
6. Position the plunger a few millimeters above the sample surface.
7. Start the test.
8. Clean the plunger, extrusion plate, and Ottawa cell before each new test.

Observations:

- At a 50 g trigger force, the probe compresses the sample to 10 mm, recording the force required to fracture the beans.
- Figure I: Force vs. Time shows hardness of beans cooked for 5 minutes vs. 7-10 minutes.

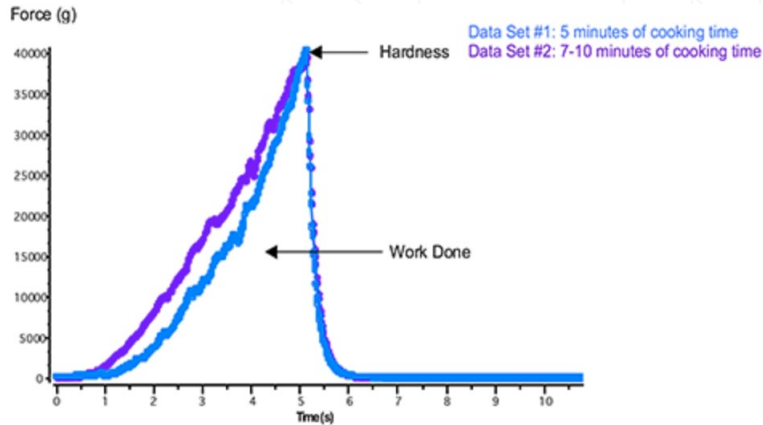


Figure I

- Figure II: Force vs. Distance displays load changes during the 10 mm compression.

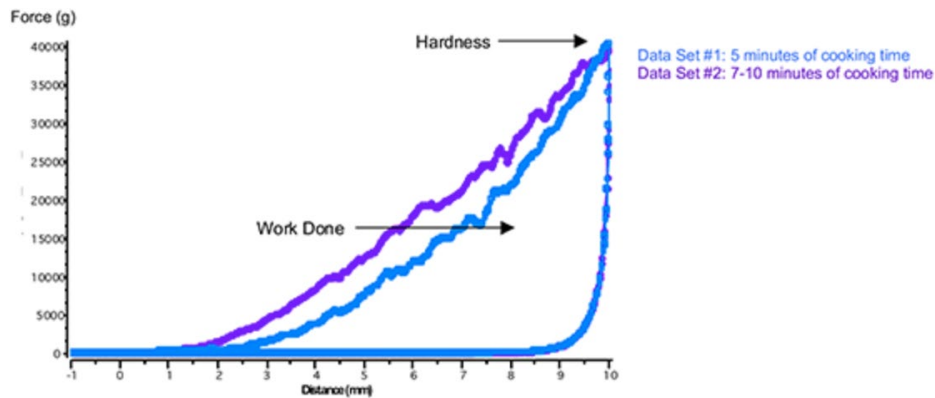


Figure II

Results:

Bean Cook Time Hardness:

- 5 minutes: 40,185 g; Work Done: 1107.2 mJ
- 7-10 minutes: 39,465 g; Work Done: 1454.9 mJ

Discussion:

The maximum force value reflects bean hardness; a higher value indicates a harder sample. The area under the curve represents the energy required to compress the beans. Beans cooked for 7-10 minutes are harder and require more energy to compress than those cooked for 5 minutes.