

# Potato Chips Texture Analysis

Hardness and fracturability testing of potato chips is essential to assess texture quality, including firmness and crunchiness, which are key factors for consumer satisfaction. This analysis provides insight into the chips' structure and crispiness for both budget and premium brands.

## Background:

- Potato chips are evaluated based on texture characteristics like hardness (peak load), work done (energy to crush), and fracturability. Bulk compression testing in an Ottawa cell measures these properties, simulating the crushing force between molars, indicating both crispiness and structural integrity.



## Equipment and Settings:

- CTX Texture Analyzer with 50 kg load cell
- Components: Ottawa Cell, Plunger, Fixture Base Table, Catchment Drawer
- Texture Pro Software
- Test Parameters:
  - Test Type: Compression
  - Pre-Test Speed: 1.0 mm/s
  - Test Speed: 2.0 mm/s
  - Post-Test Speed: 2.0 mm/s
  - Target Distance: 30 mm
  - Trigger Force: 30 g

## Sample Preparation:

1. Weigh 10 g of each brand of chips, ensuring the sample fills 50-75% of the Ottawa cell.
2. Position chips evenly within the cell for consistent testing.

## Procedure:

1. Attach the plunger to the load cell.
2. Align the Ottawa cell on the fixture base table, ensuring smooth penetration of the plunger.
3. Position the sample under the plunger, a few millimeters from the starting position.
4. Start the test and repeat for each sample type.

**Observations:**

- Figure I: Compression test graph for both chip types shows peak force (hardness) and fluctuations indicating fractures.
- Figure II: Force vs. Distance graph provides work done to compress each sample to 30 mm, indicating energy required to break internal bonds.

**Results:**

- Hardness and Work Done:
  - Budget Chips: Hardness = 6845 g, Work Done = 301.4 mJ
  - Premium Chips: Hardness = 3495 g, Work Done = 315.8 mJ
- Fracturability and Crunchiness:
  - Budget Chips: First Fracture at 4.61 mm, 31 fractures (less crispy)
  - Premium Chips: First Fracture at 3.29 mm, 61 fractures (more crispy)

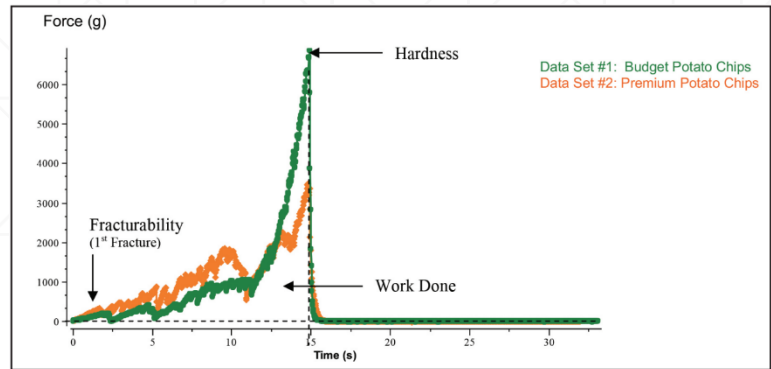


Figure I

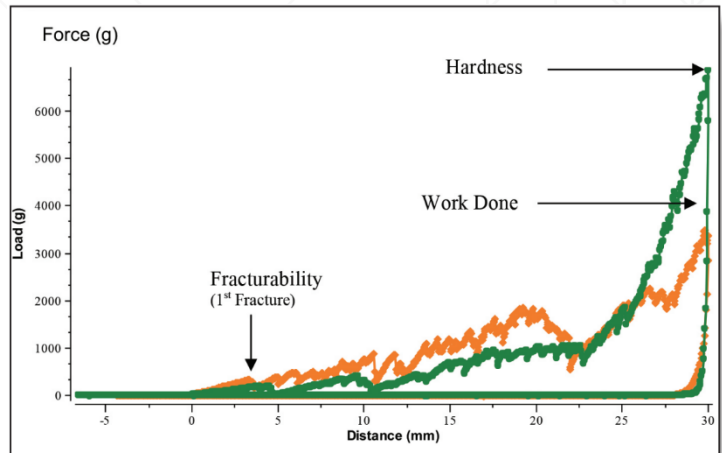


Figure II

Sample	Hardness (g)	Work Done (mJ)	Fracturability	1 <sup>st</sup> Fracture Deformation (mm)	Quantity of Fractures
Budget Chips	6845	301.4	135	4.61	31
Premium Chips	3495	315.8	335	3.29	61

**Discussion:**

Budget chips are twice as hard as premium chips, requiring more force to break and showing higher deformation before initial fracture, indicating greater elasticity. Premium chips exhibit more fractures, resulting in a crisper, crunchier texture. These measurements are critical for product quality, ensuring consumer expectations are met across different chip types.