

# Banana Chips Texture Analysis

Understanding the hardness and crispiness of banana chips is essential to ensure product quality, optimize production processes, and meet consumer expectations. The texture affects the sensory experience, and consistent texture is key for maintaining brand reputation and customer satisfaction.

## Test Objective:

- Determine the hardness and crispiness of banana chips using the Brookfield CTX Texture Analyzer (Figure 1) and Three-Point Bend (TA-TPB) Fixture (Figure 2).

## Background:

- Banana chips are produced from under-ripe banana slices, deep-fried, and can be seasoned in various ways. They are known for their crunchy and crispy texture.
- This test uses the Three-Point Bend method to compress the banana chips to a set distance and measure the force required to bend or break them, providing data on hardness and crispiness.



## Equipment:

- **Instrument:** CTX Texture Analyzer with 10 kg Load Cell (Figure 1)
- **Fixture:** Fixture Base Table (TA-BT-KIT), Junior Three-Point Bend (TA-TPB) (Figure 2)
- **Software:** Texture Pro Software (SWL-02-111)

## Settings:

- **Test Type:** Compression
- **Target Type:** Distance
- **Target Value:** 3.5 mm
- **Trigger Load:** 100 g
- **Speeds:** Pre-test: 1 mm/s; Test: 1 mm/s



**Figure 1**  
Brookfield CTX Texture Analyzer



**Figure 2**  
Three Point Fixture (TA-TPB)

**Sample Preparation:**

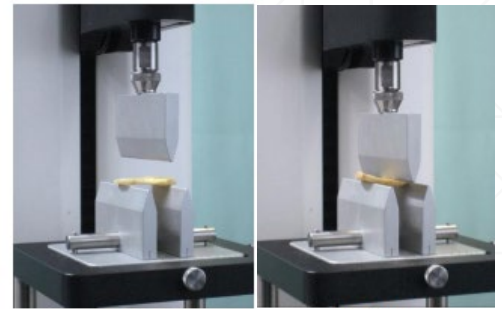
1. Store samples overnight at room temperature in original packaging (Figure 3).
2. Remove samples just before testing (Figure 4).
3. Select samples that are similar in shape, size, and thickness.



**Figure 3**  
Sort out samples that are similar in shape, size, and thickness for testing

**Procedure:**

1. Attach the TA-TPB blade to the CTX Texture Analyzer.
2. Insert table bolts and place the Fixture Base Table on the analyzer.
3. Secure the TA-TPB bottom fixture to the Fixture Base Table.
4. Align and secure the setup to ensure proper alignment for accurate data.
5. Position the sample under the blade probe and align centrally (Figure 5).
6. Set test parameters using the Texture Pro software.
7. Commence the test and repeat for all samples.

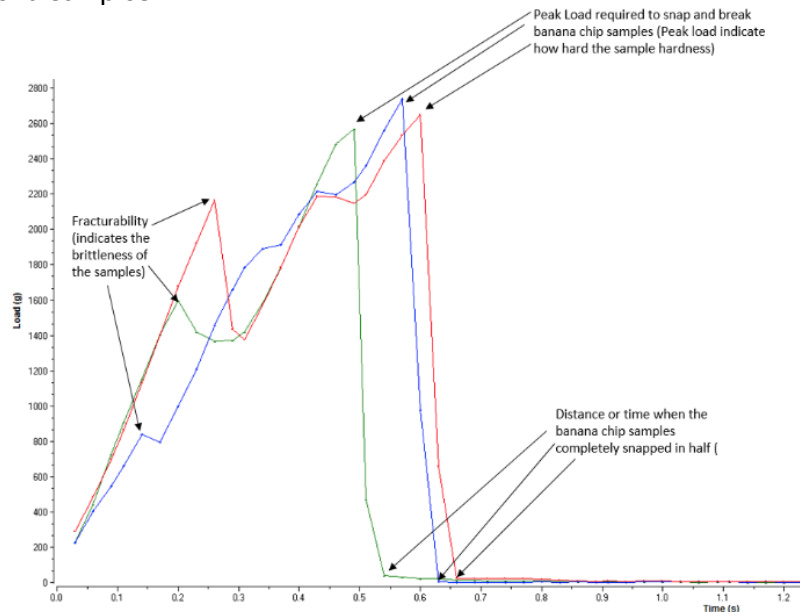


**Figure 4**  
Sample ready for testing

**Figure 5**  
Sample during testing

**Observations:**

- Upon detecting a trigger load of 100 g, the probe compresses the banana chip at a speed of 1 mm/s over 3.5 mm.
- **Figure 6:** Load vs. Time graph indicates sample hardness; Load vs. Distance graph measures work done to compress and bend samples.



The graph above displays the positive peak loads for samples tested  
The axes are Load (g) vs. Time (s).

Figure 6

Tests were repeated three times, and the results were averaged (Figure 7).

#	Sample Description	Results	Hardness	Quantity of	Fracturability	
	Product Name	Batch Name	Sample	Cycle 1	Fractures	
				g	g	
1	Tropical Snacks	BananaChip JTPB	2	2648.00	3.00	2166.00
2	Tropical Snacks	BananaChip JTPB	3	2740.00	2.00	838.00
3	Tropical Snacks	BananaChip JTPB	4	2568.00	2.00	1600.00
Calculation Settings: Fracture Sensitivity: 1% of load			Minimum	2568	2.00	838.0
			Maximum	2740	3.00	2166
			Average	2652	2.00	1535
			Standard Deviation	86.00	1.00	666.0

**Figure 7:**  
Statistical results of the tests performed on banana chip samples

#### Discussion:

- **Peak Load:** Maximum load value is a measure of sample firmness; higher values indicate harder samples.
- **Fracturability:** Indicates sample brittleness; fewer fractures mean higher brittleness.
- **Crunchiness:** Measured by the number of fractures during the first compression stroke.
- Quantity of fractures provides insight into the product's crispiness.

#### Data Report:

Texture Pro Software measures and reports:

- **Hardness (Peak Load):** Average 2,652 g force required to break the chip.
- **Work Done:** Energy required to compress the sample.
- **Quantity of Fractures:** Reflects the crunchiness and brittleness of samples.

#### Conclusion:

Test results help determine the ideal hardness and crispiness for banana chips, aiding in production consistency, quality control, shelf-life studies, and predicting consumer perception. The fracturability values are particularly useful for comparing different brands and optimizing product textures.