Crisp Bread Hardness & Fracturability by 3-Point Bend

TVT Texture Analyzer
The TVT Texture Analyzer (Figure 1) offers rapid and objective analysis for different products. The following parameters can be characterized for your product category:

- Hardness
- Fracturability
- Crispness

Both international standard methods as well as customer tailor-made profiles are available.

Figure 1: TVT Texture Analyzer

Scope
- Determination of fracturability of Crisp bread by single cycle breaking test.

Method Description
The recording of the measurement data commences once the probe reaches the pre-set trigger force. The force will then increase until the sample fractures. After fracturing of the sample, the probe returns to its starting position. This breaking test is comparable to the first bite force of a product.

Calibration
Make sure the instrument is correct calibrated before the measurements. How to perform the calibration can be found in the User’s Manual. Choose the gap carefully between the support plates. A too long gap might cause the sample to fall down and too short causes a penetration of the sample instead of a bending.

Load cell (recommended) 5 – 10 kg

Breaking Rig Set
Part number set: 67.50.45

Consisting of:
P-BP70A, Break probe 70 mm,
aluminum (Figure 2a), Part Number: 67.11.70
R-TPBR, Three point bend rig (Figure 2b)
Part Number: 67.50.40

Figure 2a: P-BP70A
Figure 2b: R-TPBR
Profile Settings

<table>
<thead>
<tr>
<th>Setting Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracturability Compression</td>
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</tr>
<tr>
<td>Sample height [mm]</td>
<td>3.0</td>
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<tr>
<td>Starting distance from sample [mm]</td>
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<tr>
<td>Initial speed [mm/s]</td>
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<tr>
<td>Test speed [mm/s]</td>
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<td>Trigger force [g]</td>
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</tr>
<tr>
<td>Data rate [pps]</td>
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</tbody>
</table>

Sample preparation

Take the sample from the package just before testing and place it on the support plates. Samples with surface pattern should always be placed in the same direction/orientation, Figure 3. Storage and handling of the samples might influence the result and should thereby be kept constant. **NOTE** Both sample width and support rig distance should be kept as constant as possible for comparability of the samples.

![Figure 3: Sample set-up](image)

Curve Description

In Figure 4 typical Force-Time curves are illustrated. The hardness/break force of the sample is given by the maximum peak force while the fracturability is the distance between the trigger force and the maximum force. A short distance is equal to a high fracturability. The area under the curve represents the total cutting force.
Large variations might occur, due to structure variations and sample placement in terms of direction/orientation. The curves in Figure 4 are measurements from the same product but with different sides facing upwards. The pink curve (A) displays the results when the sample was placed with the top surface upwards while in the blue curve (B) the sample was placed upside-down.

![Graph showing Maximum Peak Force, Hardness/Break Force, Distance, and Fracturability](image)

Figure 4: Fracture test of Finn Crisps crisp bread. A, Top surface facing upwards; B, Sample placed upside-down.

**Data Analysis**

The force required to fracture the sample is here defined as hardness/break force and can be measured in the units [g] or [N]. Fracturability is measured in [mm]. Except raw data (force, time and distance) the program also directly provides calculated results such as *mean value* and *standard deviation*. 