Grape Skin Hardness & Consistency, by Puncture

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/Firmness
- Consistency
- Resilience

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

Figure 1: TVT Texture Analyzer

Scope
- Determination of skin hardness and consistency of grapes by single cycle puncture test.

Method Description
The recording of the measurement data commences once the probe reaches the pre-set trigger force. The probe will then penetrate the sample to a pre-defined distance. After penetration, the probe returns to its starting position.

Calibration
Make sure the instrument is correct calibrated before the measurements. How to perform the calibration can be found in the User’s Manual.

Load cell (recommended) 5 – 10 kg

Probe
Needle probe, stainless steel (Figure 2)
Part number: 67.01.70

Figure 2: 67.01.70 Needle probe
Profile settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Cycle Compression</td>
<td></td>
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<tr>
<td>Sample height [mm]</td>
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<tr>
<td>Starting distance from sample [mm]</td>
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<tr>
<td>Compression [%]</td>
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<td>Initial speed [mm/s]</td>
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<tr>
<td>Test speed [mm/s]</td>
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<tr>
<td>Retract speed [mm/s]</td>
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<tr>
<td>Trigger force [g]</td>
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</tr>
<tr>
<td>Data rate [pps]</td>
<td>100</td>
</tr>
</tbody>
</table>

Sample preparation

Take the samples from their packaging just before testing. If wet, wipe them off carefully. Place the sample centrally under the probe and start the test, Figure 3. Sample temperature might influence the results and should thereby be kept constant.

![Sample set-up](image)

Figure 3: Sample set-up

Curve Description

In Figure 4 typical Force-Time curves are illustrated. The 1st peak force is here defined as the hardness of the skin, while the 2nd peak force is the firmness of the flesh at the pre-set puncture depth. The total area is the work of penetration. Due to that the penetration depth is set as a percentage of the sample’s height, the curves are shifted to each other. It can be seen in the graph that the red grapes had harder skin but a softer pulp compared to the green grapes.
Data Analysis
The force required to penetrate the samples can be measured in the units [g] or [N]. Except raw data (force, time and distance) the program also directly provides calculated results such as mean value and standard deviation.