Application manual No. 103

Production: DICED TOMATOES

Objective: Comparison of firmness of 5 types of diced tomatoes canned in calcium/water using a Kramer Shear cell

Type of action: Cutting test

Test mode settings:

Speed	Test mode	Trigger	Target	Hold
3 mm/s	Distance (c)	0 gf	48 mm	0 sec

Accessory:
Kramer shear cell - 5 blades, Platform

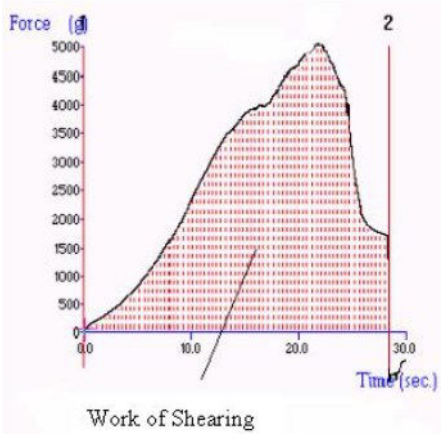
Sample Preparation:
Remove the tomatoes from their cans, drain and weigh out into equal portions. It is important that this weighed amount is enough to fill the Shear Cell by 50% of its capacity.

Test Set-Up:
The empty Shear Cell (perspex front forward) is secured in the Heavy Duty Platform, which is loosely fixed onto the machine base. The blades are attached to the load cell carrier by means of the rapid locating adapter and lowered slowly into the sample cell and through the base slots. The Heavy Duty Platform is then manoeuvred until clearance is visible between the blades and their respective slots. The Heavy Duty Platform can then be screwed into place.

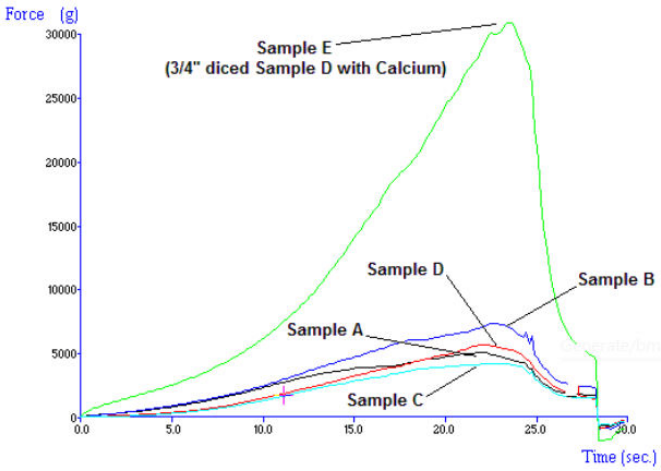
Before carrying out the test using a 'Zero' trigger one must calibrate the blades to acknowledge the bottom of the cell as a zero position. To do this, lower the blades, so that they close to the bottom of the cell. Click on **CALIBRATE Height**. Specify the distance that you want the blades to start from for each test - e.g. **45mm** is suggested. (Note: place a piece of thin flat card in the bottom of the cell to calibrate and then remove this before testing.)

The blades will move down and touch the card and then move up to the specified start distance. For the comparison of results it is crucial that the test always begins at the same distance from the bottom of the cell, this distance can be programmed into the **CONTROL PROBE** feature.

Prior to each test ensure that there is good clearance around the blades and the sides of the cell to avoid frictional effects. A 'blank' test i.e. a test without any sample in the cell can be run to check this. The blades are then raised above the cell to allow for placement of the test sample. Running a spatula (or other) horizontally across the outside edges of the blades is recommended to ensure that the blades are hanging freely. Place the sample into the cell, distribute pieces evenly and run the test. In between tests clean the blades and the grooves of the cell to remove any remaining sample, as this will cause variable results.



Typical plots:



Sample E is clearly the most firm, due to the 3/4" dicing and the fact that it had been canned with calcium. Among the non-calcified samples, the differentiation was also very clear and repeatable. The results show that the different varieties could be differentiated by both the measured peak force and the area under the curve.

Observations:

Once the blades have reached the sample, force is seen to increase at a steady rate. As the blades move down further onto the sample the force begins to increase rapidly as the sample begins to deform and rupture. After rupturing has occurred the subsequent increase in force is as a result of the force required to shear and extrude the sample through the slots in the base of the cell. The maximum force and total area under the shearing curve ("Work of Shearing") is obtained and used as an index of textural quality.

Data Analysis:

☒Max Force

Results

Sample	Mean Maximum Force (+/- S.D.) (kg)	Mean Area (+/- S.D.) (kg·s)
A	5.09 +/- 0.15	76.4 +/- 2.29
B	7.36+/- 0.07	99.9 +/- 1.10
C	4.31 +/- 0.22	57.9 +/- 4.64
D	6.35 +/- 0.38	69.2 +/- 3.46
E	31.4+/- 0.94	340 +/- 61.3

Notes:

- The Kramer shear cell is a multi-bladed device. The sample to be sheared is often variable configuration or structure. The result is an average of the forces required to cut through the sample of variable geometry.
- If the sample is firmer of one wishes to compress to a greater extent, a 50kg load cell would be recommended for a higher force range.
- When attempting to optimize test settings it is suggested that the first tests are performed on the hardest samples to anticipate the maximum testing range required and ensure that the force capacity allows testing of all future samples.