

Production: PITTED OLIVES (without stones)

Objective: Measurement of firmness of olives by bulk shearing using a Kramer Shear Cell

Type of action: Cutting test

Test mode settings:

Speed	Test mode	Trigger	Target	Hold
1.5 mm/s	Distance (c)	0 gf	39 mm	0 sec

Accessory:

Kramer shear cell - 5 blades, Platform

Test Set-Up:

The empty Shear Cell (Perspex front forward) was secured in the Heavy Duty Platform, which was loosely fixed onto the machine base. The blades were 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 was then manoeuvred until clearance was visible between the blades and their respective slots. The blades were then raised above the cell to allow for placement of the test sample (28 olives).

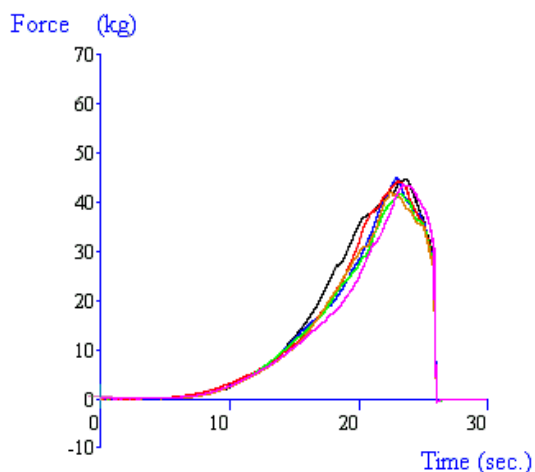
The blades were calibrated to acknowledge the bottom of the cell as a zero position. The specified distance that the blades were to start from for each test was 40mm. (Note: a piece of thin flat card was placed in the bottom of the cell to calibrate and then removed before testing.)

For the comparison of results it was crucial that the test always began at the same distance from the bottom of the cell, this distance was programmed into the **CONTROL PROBE** feature.

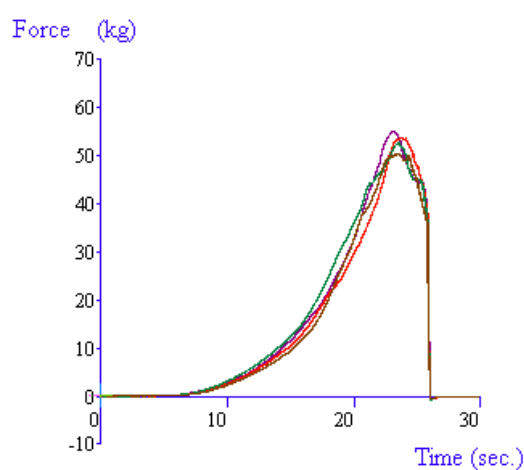
Prior to each test it was ensured that there was good clearance around the blades to avoid frictional effects, i.e. so that the blades were not touching the sides of the cell. A 'blank' test i.e. a test without any sample in the cell checked this. The blades were then raised above the cell to allow for placement of the test sample. A spatula (or other) was run horizontally across the outside edges of the blades to ensure that the blades were hanging freely. 28 olives were placed into the cell and distributed evenly. The test was run. In between tests the blades and the grooves of the cell were cleaned to remove any remaining sample, as this would cause variable results.

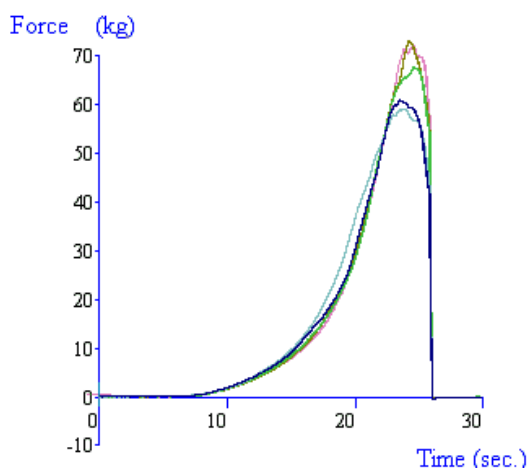
Typical plots:

Batch 1



Batch 2



Batch 3

The above curves were produced from 28 green pitted olives tested at 20°C.

Observations:

Once the blades had reached the sample, the force was seen to increase at a steady rate. As the blades moved down further onto the sample the force increased rapidly as the sample began to deform and rupture. After rupturing had occurred the subsequent increase in force was as a result of the force required to shear and extrude the sample through the slots in the base of the cell. The maximum shear force and the area under the curve ("the energy involved in performing the test" or the 'work of shear') related to the firmness of the sample.

Data Analysis:

☒ Max Force

☒ Area (+)

Results

Sample	Mean Max. +ve Force 'Firmness' (+/-S.D.) (kg)	Mean Area 'Work of Shear' (+/-S.D.) (kg.s)
1	43.5 +/- 1.2	354.6 +/- 16.7
2	53.0 +/- 1.7	405.8 +/- 16.1
3	66.7 +/- 5.7	431.7 +/- 8.4

Notes:

- The results clearly show that Batch 3 is substantially firmer than Batches 1 and 2, Batch 1 being the least firm of all samples.
- If the sample is harder/tougher or it is found to be necessary to shear to a greater extent, a 250kg 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