Production: POTATO CRISPS

Objective: Comparison of textural qualities of crisp samples by bulk compression using an Ottawa cell

Type of action: Extrusion test

Test mode settings:

Speed	Test mode	Trigger	Target	Hold
2 mm/s	Distance (c)	0 gf	52 mm	0 sec

Accessory:
Ottawa Cell, Platform

Sample Preparation:
Remove the crisps from place of storage just prior to testing. Samples should be weighed into equal portions. It is important that this weighed amount is enough to fill the Ottawa Cell by at least 50% of its capacity e.g. 25g.

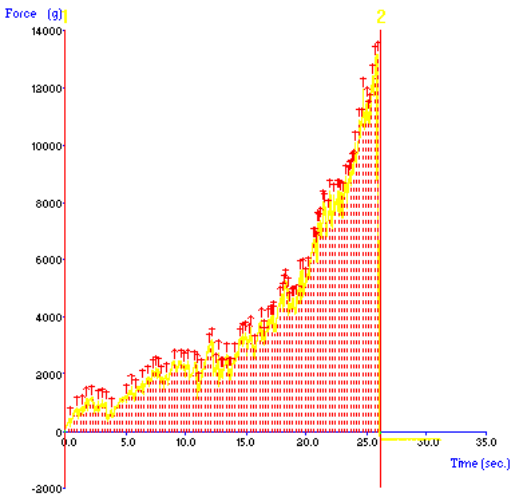
Test Set-Up:
The empty Ottawa Cell is loosely fixed onto the machine base. The plunger is attached to the load cell carrier and is lowered slowly into the Ottawa Cell. The Ottawa Cell is then moved until clearance is visible between the plunger and the sides of the cell. The Product Catchment Drawer is positioned under the Ottawa Cell, to catch the extruded sample. The plunger is then raised above the cell to allow for placement of the test sample.

Before carrying out the test using a 'zero' trigger one must calibrate the plunger to acknowledge the bottom of the cell as a zero position. To do this, lower the plunger, so that it is close to the bottom of the cell. Click on **CALIBRATE HEIGHT**. Specify the distance that you want the plunger to start from for each test - e.g. **70mm** is suggested.

The plunger will move down and touch the extrusion plate 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 plunger to avoid frictional effects. This can be checked by running a 'blank' test i.e. one without any sample in the cell, to ensure that the plunger is not touching the sides. The plunger is then raised above the cell to allow for placement of the test sample. Place the sample into the cell, distribute crisps evenly and run the test. In between tests clean the plunger, extrusion plate, and the inside of the cell to remove any remaining sample, as this will cause variable results.

Typical plots:



The left curve was produced from testing 25g of potato crisps at 20C.

Observations:
As compression proceeds fracture could be observed as a series of force peaks. The area under the curve was noted as an indication of sample 'Toughness' and the number of major peaks (e.g. over 200g force threshold) was considered as an indication of 'Crispiness'. Another indication of 'Crispiness'/ 'Fracturability' was also used, Linear Distance, which is measured by calculating the length of the curve between two anchors. After the probe has compressed the sample to 18mm above the extrusion plate it then proceeds to return to the starting position.

Data Analysis:

☒Area (+)

☒Linear Distance (from 2 to 25 second)

Results

Sample	Mean Linear Distance 'Crispiness' (+/- S.D.)	Mean No. of major peaks 'Crispiness' (+/- S.D.)	Mean Area 'Toughness' (+/- S.D.) (kg·s)
A	1630.9 +/- 4.4	88 +/- 7.1	93.6 +/- 4.4

Notes:

- The sample to be crushed is often of variable configuration or structure. The result is an average of the forces required to crush the sample of variable geometry.
- If the sample is tougher, a 50kg load cell is 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.