Production: PUFFED RICE CEREAL

Objective: Comparison of hardness and crispness of puffed rice cereal by bulk compression

Type of action: Extrusion test

Test setting:

Speed	Test mode	Trigger	Target	Hold
5 mm/s	Distance (c)	0 gf	50 mm	0 sec

Accessory:

Ottawa Cell, Platform

Sample Preparation:
Samples of puffed rice are removed from place of storage just prior to testing and weighed into equal portions. It is important that this weighed amount is enough to approximately fill the Ottawa cell by 50% of its capacity e.g. 30g.

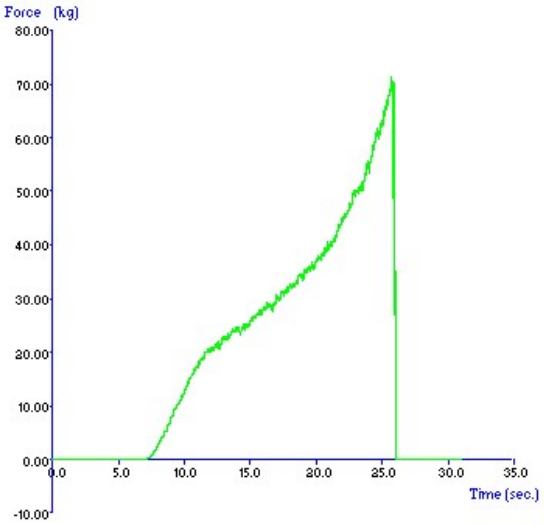
Test Set-Up:
The empty Ottawa Cell is loosely fixed onto the machine base. The plunger is attached to the load cell carrier and is lowered slowly into the Ottawa Cell. The Ottawa Cell is then manoeuvred until clearance is visible between the plunger and the sides of the cell. The Product Catchment Drawer 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 'Button' 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. Specify the distance that you want the plunger to start from for each test - e.g. 60mm 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, and spread it out to create a level testing surface. 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 above curve was produced from testing 30g puffed rice grains at 20C.

Observations:
Once the plunger has reached the sample (from a starting position of 60mm from the base), force is seen to increase at a steady rate. As the plunger moves down further onto the sample the force begins to increase rapidly as the sample begins to fracture. As compression proceeds fracturing can be observed as a series of force peaks. The maximum force value was considered to be an indication of the overall 'hardness' of the puffed rice sample and the linear distance was considered as an indication of 'crispness'. The greater the linear distance, the crisper is the product.

Data Analysis:

☒Max Force

☒Linear Distance From 2 to 25 second

Results

Sample	Mean Max. Force 'Hardness' (+/- S.D.) (kg)	Mean Linear Distance 'Crispness' (+/- S.D.)
A	3.40 +/- 0.75	3634.8 +/- 106.3

Notes:

- The Noise emitted during this test can be measured and analysed using an Acoustic Envelope Detector.
- The sample to be compressed is often of variable configuration or structure. The result is an average of the forces required to compress and extrude the sample of variable geometry.
- The extent of compression and extrusion has been based on the use of an Ottawa cell with a 100kg load cell. A greater degree of compression and extrusion would therefore require a 250kg load cell.
- The 'bowl life' (texture analysis after immersion in milk for various times) can be assessed with the use of a blank watertight base plate. Milk is contained in the Ottawa cell for the desired immersion time and then quickly released into a liquid catchment tray before testing of the sample.
- When attempting to optimise 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.