Production: BISCUITS/COOKIES

Objective: Comparison of the hardness and fracturability of shortbread and ginger nut biscuits by penetration with a cylinder probe

Type of action: Penetration test

Test mode settings:

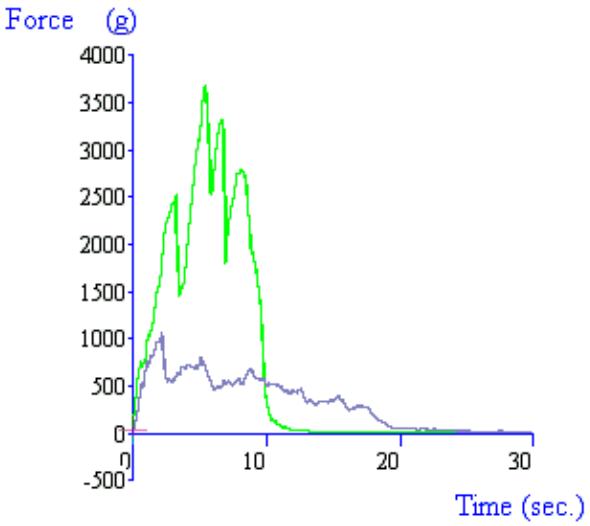
Speed	Test mode	Trigger	Target	Hold
0.5 mm/s	Distance (c)	5 gf	2 mm	0 sec

Accessory:
ϕ 2 mm cylinder probe, Platform

Sample Preparation:
Samples are removed from their packets only a short time before testing.

Test Set-Up:
Secure the holed plate into the Heavy Duty Platform. Adjust the position of the Heavy Duty Platform so that the probe is directly above the hole of the holed plate. Place the sample centrally on the plate and commence the penetration test.

Typical plots:



The above curve was produced from shortbread and ginger nut biscuits.

Observations:
Once the trigger force of 5g has been attained, the probe proceeds to penetrate the sample to the specified distance. The probe then returns to its start position. The fluctuations are a result of the biscuit fracturing and if there are large inclusions (e.g. chocolate chips) in the biscuit, these also add to fluctuations in the force readings. It is for this reason that the area under the curve is taken as an indication of the hardness, and the linear distance as an indication of fracturability. The results of this test show ginger nuts to be more than twice and hard and fracturable as the shortbread samples.

Data Analysis:

☒Area (+) from 0 to 10 sec

☒Linear Distance from 0 to 10 sec

Results

Sample	Mean Area 'Hardness' (+/- S.D.) (g s)	Mean Linear Distance 'Fracturability' (+/- S.D.)
Shortbread	8839.4 +/- 792.8	71.9 +/- 3.5
Ginger nut	19062.5 +/- 2070.2	147.5 +/- 23.1

Notes:

- The variation of the results from this particular test method will depend upon the structure of the biscuit/cookie, i.e. the presence inclusions e.g. nuts will cause large force fluctuations. It is for this reason that the variation of the test results may seem quite high.
- The test distance may need to be modified to penetrate to a greater depth into the sample. This will subsequently increase the 'Hardness' and 'Fracturability' values. Any values obtained are only relative at the specified distance to which they are penetrated.
- If penetrating the same biscuit more than once, consideration should be taken as to the test hole proximity's or any cracks caused by previous tests i.e. penetration must not be carried out too close to neighboring holes or to cracks.
- In order to make comparisons between tests, the same part of the biscuit/cookie should be tested.
- The Linear Distance function calculates the length of an imaginary line joining all points in the selected region. A jagged curve would consequently produce a much larger linear distance value when compared to a smooth curve. The greater the linear distance value the easier the sample is fractured. The answer has no defined units.
- 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.
- Storage, packaging and handling of the sample before testing are considered parts of variable conditions under which the biscuit/cookie is tested. It is important to identify these conditions when reporting results and they should be kept constant for comparison purposes.