

Production: CHOCOLATE

Objective: Comparison of hardness of 4 different sample formulations of chocolate by penetration

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

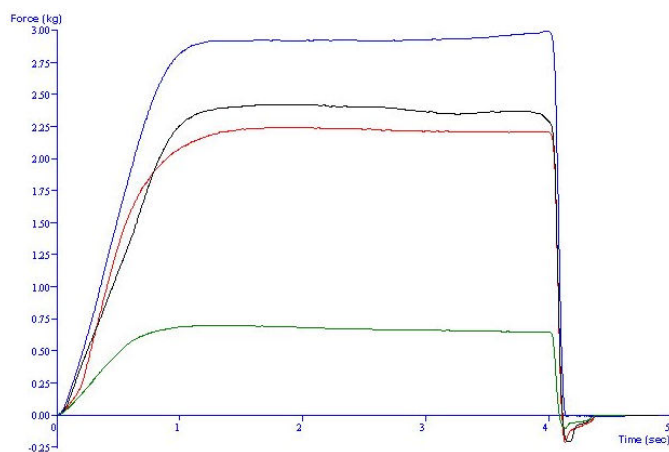
Accessory:

φ2 mm cylinder probe, Platform

Sample Preparation:

The samples were equilibrated at a controlled temperature e.g. 20C, prior to testing.

Typical plots:



The above curve was produced from 4 different formulations of chocolate bars, tested at 20C

Observations:

The force starts to increase as the probe penetrates the surface of the chocolate. The yield point is the point at which the graph plateaus and plastic flow of the material begins. The average force of this plateau can be taken as the hardness and the total area under the graph as the work of penetration.

Data Analysis:

☒Area (+)

Results

Sample	Mean Area (+) 'Hardness' (+/- S.D.) (kg.s)
A	7.9 +/- 0.2
B	8.1 +/- 0.4
C	10.9 +/- 0.5
D	2.4 +/- 0.2

Notes:

- It may be necessary to modify the test to penetrate to a lesser/greater depth into the sample. This will subsequently decrease/increase the 'Hardness' values. Any values obtained are only relative at the specified distance to which they are penetrated.
- Storage, packaging and handling of the sample before testing are considered variable conditions under which the sample is tested. It is important to identify these conditions and keep them constant when reporting results of firmness tests for comparison purposes.
- 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.