Production: BISCUIT DOUGH

Objective: Measurement of the hardness of biscuit dough by penetrating with a cylinder probe

Type of action: Penetration

Test setting:

Speed	Test mode	Trigger	Target	Hold
3 mm/s	Distance (c)	5 gf	20 mm	0 sec

Accessory:

Dough hardness rig, ϕ 6 mm cylinder probe

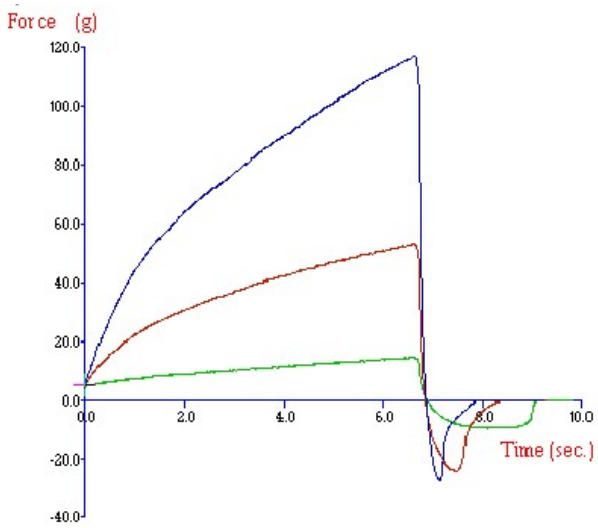
Sample Preparation:

Prepare the biscuit dough according to the user factory standard procedure. Weigh out enough dough to fill the dough cell e.g. 110g. Randomly distributed pockets of air in the dough are seen as a potential cause of variability in consistency measurements. To overcome this, place the aeration plunger into the dough pot which compresses the dough and removes air pockets whilst minimising handling and work softening of the dough. Remove this plunger to leave an uneven surface. Flatten the surface by pressing the flattening plunger as far as it will go into the dough cell.

Test Set-Up:

Place the dough cell on the machine base and position it centrally under the cylinder probe. Commence the penetration test.

Typical plots:



Ingredient	A	B	C
Margarine	25%	20%	15%
Sugar	25%	20%	15%
Flour	50%	60%	70%
Egg (based on 300g of other ingreds.)	1	1	1

The above curves were produced from 110g of the following biscuit dough formulations, tested at 20C:

Observations:
Once a trigger force of 5g is attained the probe then proceeds to penetrate into the dough to a depth of 20mm. During penetration the force is seen to increase up until the point of maximum penetration depth. This force value is taken as the 'Hardness' at this specified depth. The probe then proceeds to withdraw from the sample.

Data Analysis:
☒Max Force

Results

Dough Formulation	Mean Max. Force 'Hardness' (+/- S.D.) (g)
A	15.3 +/- 0.5
B	43.8 +/- 2.2
C	122.9 +/- 6.6

Notes:
- The Noise emitted during this test can be measured and analysed using an Acoustic Envelope Detector.
- The steps in sample preparation and measurement could both contribute to the operator dependence of dough consistency measurements. In preparing the dough sample the extent of air removal and the degree of manual manipulation are potentially operator dependent and should be considered if variation in results is seen to be unacceptably high.
- The test distance may need to be modified to penetrate a greater depth into the sample. This will subsequently increase the 'Hardness' values. However, the penetration should not exceed more than 75% of the depth of the sample. Any values obtained are only relative at the specified distance to which they are penetrated.
- When testing, penetration into the dough cell more than once may be required. If doing this, consideration should be made to the test hole proximities, i.e. penetration must not be carried out too close to neighbouring test holes or to the walls of the dough cell.
- 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.

Reference:

This method is an adaptation of the following publication:

MILLER, A. R. (1984). Rotary moulded short-dough biscuits. Part V: The use of penetrometers in measuring the consistency of short doughs. Flour Milling and Baking Research Association: Report No. 120.