Stickiness of Bread Dough

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Within the baking industry stickiness is of particular economic concern as it causes problems in the processing of dough, where sticky dough builds up on machinery leading to loss of both time and product [1, 2]. Measurements currently are commonly subjective based on a baker's assessment of the feel of the dough.

There is currently no universal measure for stickiness. Stickiness is a combination of adhesion and cohesion and is therefore a result of both surface and rheological properties.

The aims of this project are as follows:

(1) To develop a predictive test for the bakery industry, to be used on site to determine whether a batch will be sticky.
(2) To characterise the properties of bread dough with particular emphasis on the adhesive properties.
(3) To investigate the causes of dough stickiness.
(4) To investigate the possibility of reworking sticky dough to allow the dough to be processed.

Compression tests on dough are being investigated as a means of measuring and quantifying dough stickiness. The stickiness measurement is based on the energy per unit area for the compression from a set strain to a target strain. The area for this is determined by the use of video analysis to determine the contact radius and therefore calculate the contact area, based on the assumption of an axisymmetric shape.

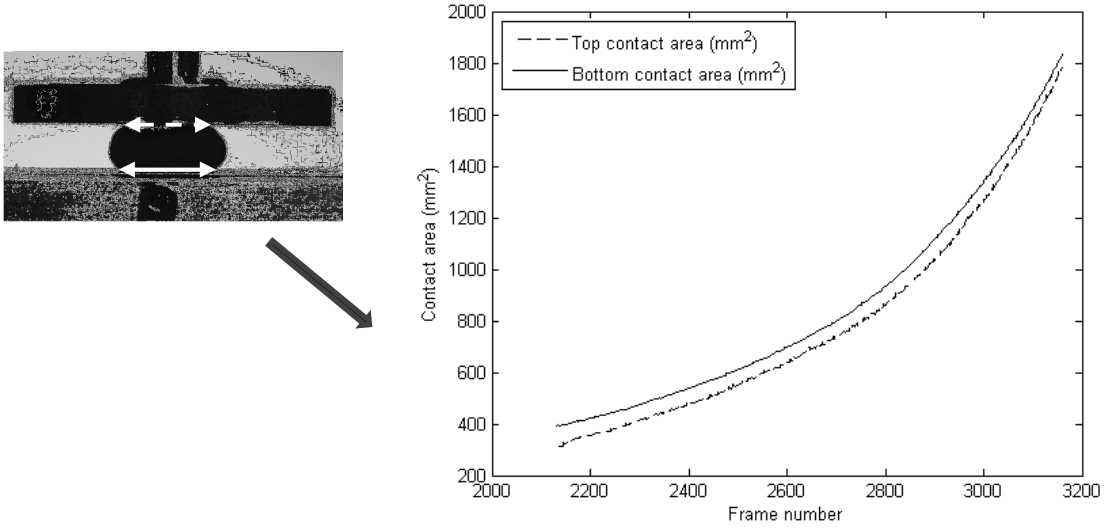

Figure 1: Example frame from a compression video and an example of the resulting curve showing the contact area for the top and bottom of a dough piece as found by analysis of the video

Bakers score dough on the subjective attributes “softness” and “stickiness” separately. A soft material is often stickier as it can flow giving better surface coverage, and therefore stronger adhesion, while also tending to be cohesively weaker. However, it is desirable for a dough to be soft but not sticky and it is therefore important to separate the two attributes. With the lack of a suitable reference method, comparison to bakers’ scores is the primary method by which the efficacy of a measurement is being determined.

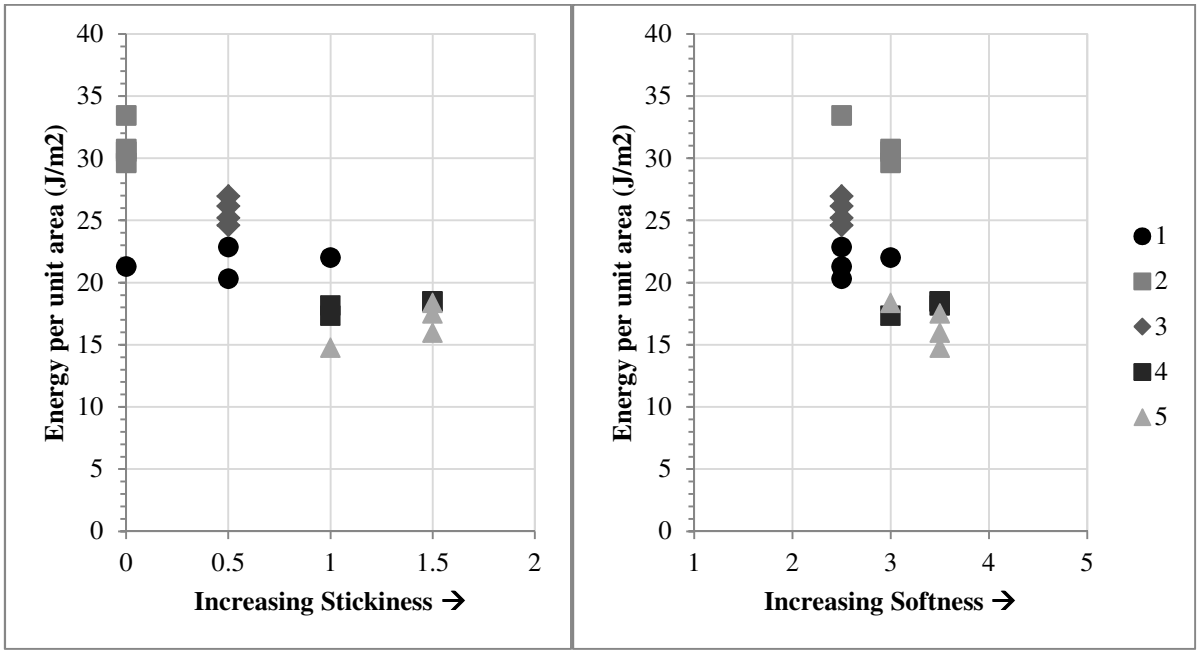

Figure 2: Correlation of energy measured during a compression test with Baker’s scores for 5 samples (n = 4). Stickiness is on a scale of 0 (not sticky) to 2 (very sticky). Softness is rated 1 – 5 (tight to soft) where 3 is optimum.

Doughs with a range of softness and stickiness scores, as determined by a baker, were produced through a combination of ingredient and mixing variations. A significant correlation (-0.830 at p = 0.000) was observed between Baker’s Stickiness scores and the energy per unit area required to compress the sample to a target strain. These results were also compared with Baker’s Softness scores which showed a less significant and weaker correlation (-0.586 at p = 0.007).

Results from the compression of dough samples showed a stronger and more significant correlation with stickiness than softness. This suggests that, with further development, the technique could allow separation of the parameters stickiness and softness.

References

[1] B. J. Dobraszczyk, "The Rheological Basis of Dough Stickiness," *Journal of Texture Studies,* vol. 28, pp. 139-162, 1997.

[2] S. M. Wang*, et al.*, "Dough Profiling: An Instrumental Method for Dough Stickiness Measurement " *Cereal Chemistry,* vol. 73, pp. 445-451 1996.