Campden BRI
Station Road
Chipping Campden
Gloucestershire
GL55 6LD, UK

Tel: +44 (0)1386 842000
Fax: +44 (0)1386 842100
www.campdenbri.co.uk

Bread Softness Club Proposal

Martin Whitworth and Sarab Sahi
Campden BRI

Aim:

To provide a better understanding of the factors that influence softness and texture of bread, and how this changes over shelf life. Thus, to identify strategies to improve the creation and control of softness.

Background:

Softness is an important quality attribute of many types of bread. Additional textural properties include springiness of the crumb, and resistance to tearing. Softness of bread derives partly from its low density foam structure, but is also critically dependent on the viscoelastic properties of the crumb. Following baking and cooling, physico-chemical processes cause firming of bread during storage, culminating in the product going stale, and lack of softness is often perceived as lack of freshness. Staling is partly caused by starch crystallisation[1], which occurs most rapidly at chilled temperatures, creating challenges for products such as sandwiches. Moisture migration may also occur during storage, initially causing toughening of crust, followed by moisture loss and increased crumb firmness. A range of ingredients are available that claim to improve softness over shelf life. These can achieve their effect by increasing the initial softness directly or by effects on crumb structure, or by reducing the rate of firming. This project will study the effect of ingredient properties, recipe and process variations on softness, firming, and related mechanical properties of bread crumb. The project will seek to identify the mechanisms involved, including crumb structure and physico-chemical effects, and thereby to propose approaches to improve the creation and control of bread softness.

Potential areas of study:

- Effects of ingredient, recipe and process variations on initial bread softness. Key ingredient factors include the role of flour components (starch, protein, lipids, AX), interactions with water, fat, emulsifiers and enzymes, as well as processing conditions.
- Changes in softness over shelf life and effects of storage conditions including ambient, chilling and freezing/thawing.
- Effects of bread bubble structure, anisotropy and distribution within slices and within loaves.
- Definition and measurement of softness and other textural attributes. Current tests include double compression between flat plates, but provide an incomplete description, and interpretation is often poor and terminology misleading.
- The relationship between crumb and crust texture.
- Interaction with other product components such as sandwich fillings, packaging and moisture barriers.

[1] The Mechanism of bread staling, FMBRA Report 47, 1971

Experimental methods:

- Test baking and controlled storage
- Texture profile analysis (e.g. Figure 1)
- Starch properties: Differential scanning calorimetry (DSC), polarised light microscopy
- Moisture content, water activity, Hyperspectral NIR imaging of moisture distribution.
- X-ray micro CT high resolution 3D imaging and measurement of crumb structure.
- C-Cell analysis of crumb structure.
- Strain distribution mapping (Figure 2)
- Mathematical modelling of crumb structure effects on softness [proposed investment]

Figure 1: Texture analysis with a blade

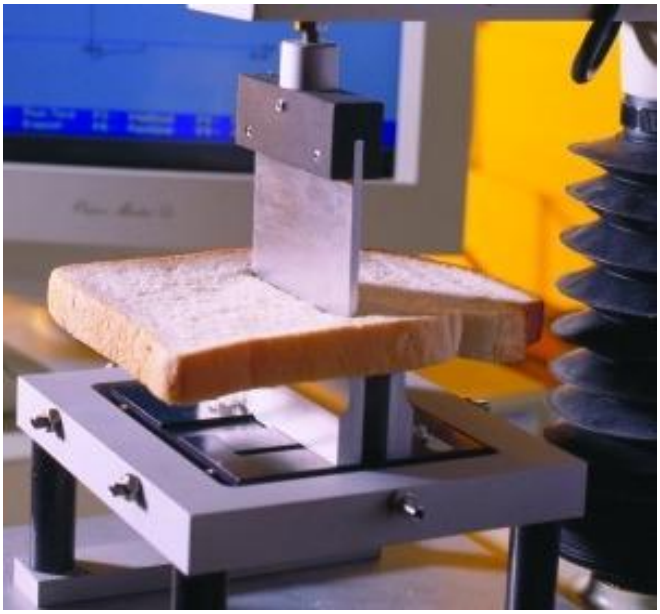
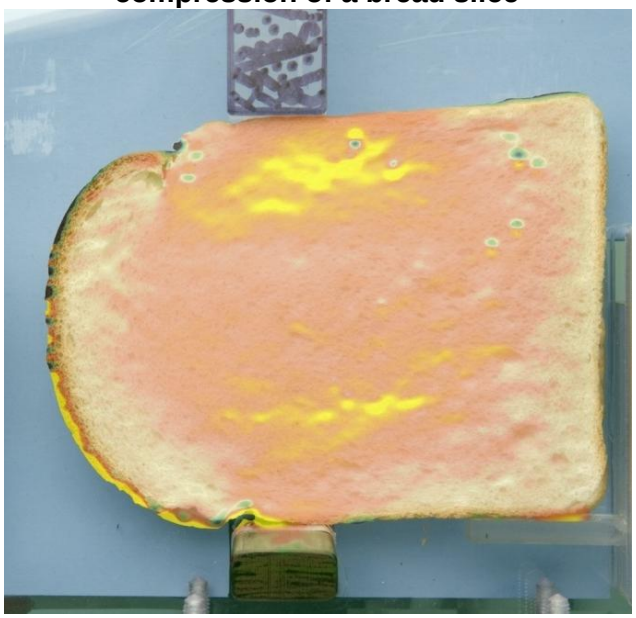


Figure 2: Strain distribution for side compression of a bread slice



Benefits to partners:

The project will increase our understanding of the factors that influence the textural properties of bread and how this can be controlled to achieve and maintain soft texture over shelf life. Each company can exploit the findings for their own commercial purposes.

Who should join:

The project is suitable for bread manufacturers, suppliers of bakery ingredients, processing equipment, analysis instruments, and manufacturers, distributors and retailers of sandwiches and bread products.

Project structure:

This pre-competitive project will be run as an industrial club, to be funded and steered by a private consortium of interested parties. The project will be subject to a consortium agreement covering issues such as confidentiality and ownership of arising intellectual property.

Duration and cost:

- 3 years
- Target start date: 1st January 2018
- Each participant will contribute a fee of £10,000 (at Campden BRI member rate) in each of the 3 years (£30,000 total).

Contact: martin.whitworth@campdenbri.co.uk; Tel: +44 (0)1386 842139