Overcoming the quality issues in low-fat cheese

Nutrilac® whey proteins fill the fat gap in hard and soft cheese

Abstract

Making high-quality, low-fat cheese has always been a challenge. As soon as fat is taken out of the recipe, the impact on taste, texture and appearance is typically severe – whether producing a hard cheese such as cheddar or a soft-textured brie. Consumer concern about additives has left many cheese manufacturers looking for a natural solution.

Studies suggest that microparticulated whey protein (MWP) could be the answer. According to results from the Wisconsin Center for Dairy Research in the US, MWP's ability to simulate fat globules has a positive effect on the quality of low-fat cheddar. Trials with low-fat brie in the Arla Foods Ingredients dairy application centre have produced similar findings.

This white paper covers the challenges encountered during low-fat cheese production and their solutions. All MWP used for the studies comes from the Arla Foods Ingredients Nutrilac® range.

Arla Foods Ingredients
Discovering the wonders of whey

The technical challenges

- Lower yield
  Fat reduction leaves a gap in the cheese matrix that automatically reduces yield, raising the price per kilo compared to full-fat cheeses.

- Poor sensory appeal
  Cheese fat content has a strong influence on taste and texture. So, when fat is taken out, the taste becomes bland and the texture hard and rubbery. Low-fat cheese is also often characterised by a pale, transparent appearance.

- Difficult moisture control
  An impaired water-binding ability means low-fat cheese becomes firm from an early age, making it difficult to shred and slice.

Effects on yield and quality in low-fat cheddar

A study at Wisconsin Center for Dairy Research, part of the University of Wisconsin-Madison, tested MWP as a potential fat replacer in low-fat (~7.3%) cheddar cheese[1]. At addition levels of 0.15%, 0.35% and 0.5%, the water-binding ability of MWP was seen to improve cheese yield (figure 1). A sensory evaluation found no detectable off-flavours.

During the first 90 days of ripening, the cheese with 0.5% MWP was noticeably softer than the other cheeses. This indicates a clear improvement on standard low-fat cheddar products, which tend to become firm and difficult to shred and slice from an early age.

The study was published in the International Journal of Dairy Technology in 2017.

	Yield (kg/100kg milk)
Control	7.22
0.15% MWP	7.26
0.35% MWP	7.51
0.5% MWP	7.69

Figure 1: Actual yield in study of low-fat cheddar cheese produced with MWP

Evaluating MWP in low-fat soft cheese

For the Arla Foods Ingredients trial with low-fat (~11%) brie, a reference batch and a batch with 0.6% MWP were produced with a similar pH and fat content. The soft cheeses were then salted in brine for 40 minutes, stored at 16°C for eight days to promote mould growth and stored in foil for six weeks at 5°C.

During the ripening period, a weekly analysis measured the composition, microstructure, firmness, ripening and sensory quality of the soft cheeses. Here are the findings:

- Increased yield
  Figure 2 shows the similar composition of the two soft cheese batches. The higher moisture content of the cheese with MWP is due to the improved water-binding ability. Along with the slightly high content of added fat and protein at the start of processing, this water binding results in 10.9% higher yield than the reference cheese.

- Improved softness
  Compared to the reference, the soft cheese with MWP ripened faster, becoming visibly softer. Clear differences were visible after four weeks of storage, becoming increasingly apparent up to week seven. The cheese with MWP was also whiter and less transparent than the reference (figure 3).

  Firmness was further measured by textural analysis. This reinforces the visual observation of improved softness in the soft cheese with MWP (figure 4).

- Sensory performance
  An external sensory panel assessed 11 attributes of the soft cheeses, covering odour, appearance, consistency, mouthfeel, taste and overall impression (figure 5). Compared to the reference, the soft cheese with MWP had a significantly better sensory quality. Softness, creaminess, mouthfeel, flavour and appearance were all improved.

Component in %	Reference	With 0.6% MWP
Fat	11.40	10.90
Protein	25.74	24.72
NaCl	1.60	1.83
Moisture	56.00	57.05
Fat in dry matter	25.91	25.38
pH	5.15	5.10
Yield (based on 100 kilos of cheese milk)	10.730 kg	11.903 kg
Yield increase	–	10.9%

Figure 2: Final composition, pH and yield of the two low-fat soft cheeses after brining

Ripening time (weeks)	Reference	With MWP
1		
2		
3		
4		
5		

Figure 3. Storage-induced changes of the low-fat brie with MWP and the reference from one to seven weeks

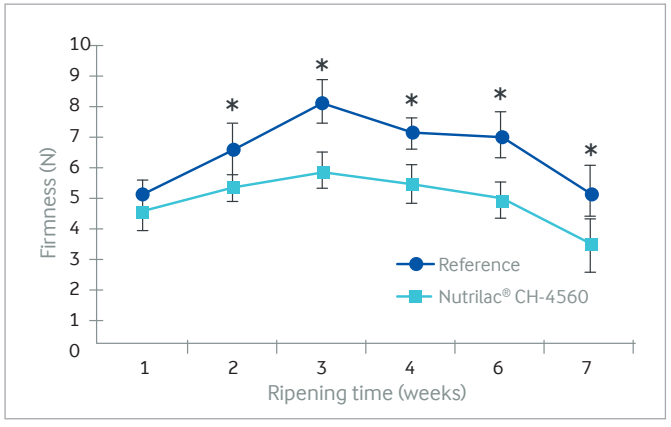

Figure 4: Development of soft cheese firmness during ripening

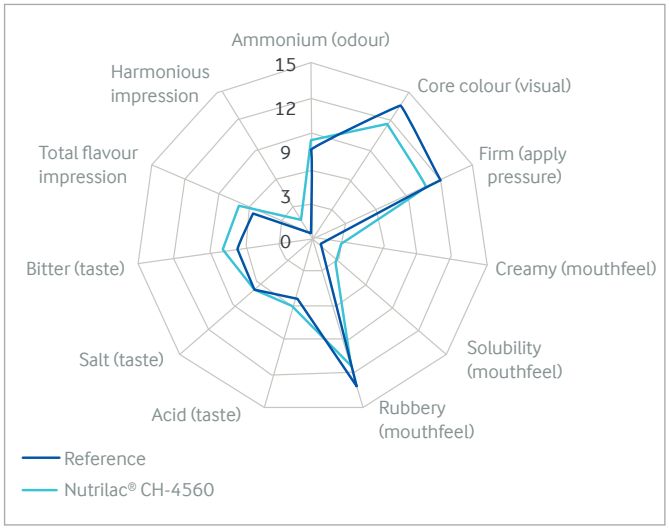

Figure 5. Sensory profiling of low-fat soft cheeses with and without MWP after seven weeks in storage.

Summary

The studies of low-fat cheddar and brie confirm the ability of MWP from the Nutrilac® range to simulate the all-round properties of fat. This highlights the possibilities to overcome the major quality shortfalls of low-fat cheese, such as rubbery texture, poor yield and loss of creaminess and taste. For cheese manufacturers, MWP eases processing by countering the development of firmness and optimises raw material use. Altogether, the studies' findings provide a strong case for MWP as a way to cut costs and build a stronger consumer brand.

Don't hesitate. Get in touch

Interested in learning more about how you can use Nutrilac® for low-fat cheese? Send us a mail, and we'll get back to you as soon as possible.

Write to dairy@arlafoods.com

Reference

1. *Stankey, J et al. 'Low-fat cheddar cheese made using micro-particulated whey proteins: Effect on yield and cheese quality', International Journal of Dairy Technology, 2017*

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Contact us at dairy@arlafoods.com

Arla Foods Ingredients Group P/S
Sønderhøj 10-12
8260 Viby, Denmark

www.arlafoodsingredients.com

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