Make acid whey an asset to your dairy business

Nutrilac® whey proteins bring out the best in acid whey and maximise milk yield

Abstract

As every manufacturer of strained fermented dairy products knows, only a third of the milk they pour into the vat at the start of processing will end up in their final product – whether it's Greek yoghurt, quark, skyr, cream cheese or cottage cheese. Two-thirds of the milk will be left over in the form of acid whey. Quite an unsatisfactory yield from an expensive raw material.

Disposing of acid whey is both costly and a potential risk to the environment. So some manufacturers have begun asking how they can put the valuable nutrients in acid whey to good use in new food products that generate revenue for their business.

For us at Arla Foods Ingredients, this was a challenge we could not refuse. After all, our entire range of speciality ingredients is derived from whey – previously regarded as a by-product of cheese production but now a valued raw material in its own right.

Our R&D has investigated the possibilities to produce fermented whey drinks, cream cheese and desserts using acid whey with specially selected Nutrilac® proteins. This white paper describes the findings of our trials.

Arla Foods Ingredients

Discovering the wonders of whey

The challenges

Acid whey is an unavoidable by-product when dairy companies use the traditional straining method to give Greek yoghurt, for example, its characteristic creamy texture and high protein content (figure 1). Until now, disposal and use of acid whey have presented a series of challenges.

- Raw material waste
  Milk is an expensive commodity. Due to the low yield of strained fermented dairy production, manufacturers only use a third of the milk they buy. They are unable to use the nutrient-rich acid whey that remains.

- High costs of disposal
  Acid whey is typically offloaded into the animal feed and biofuel markets or simply enters the dairy's waste stream. These disposal options are associated with high overheads and environmental concerns.

- Phase instability
  The low pH of acid whey – often below 5 – poses a significant technical challenge. When milk proteins are added, there is a strong tendency to phase instability. This means proteins precipitate out of the solution during heat treatment or storage.

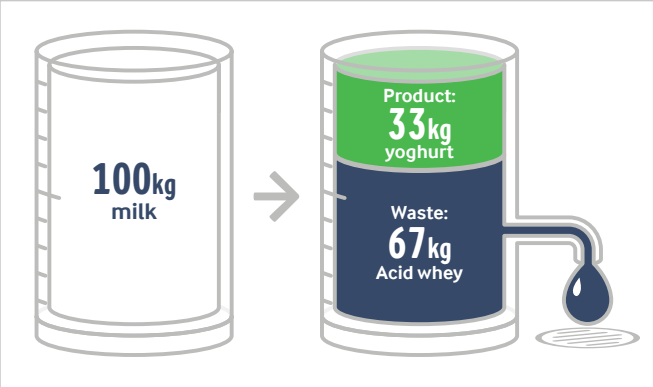

Figure 1: Traditional strained Greek yoghurt process

Alternative options for adding value to acid whey

At Arla Foods Ingredients, we wanted to offer dairy companies an alternative, value-adding way to deal with acid whey. Our starting point was specially selected whey proteins which, when combined in Nutrilac® solutions, are able to tolerate processing and storage at a low pH without precipitation. The aim is to produce stable end products with a desirable viscosity and creamy mouthfeel.

We have tested our Nutrilac® proteins in fermented whey drinks, cream cheese and desserts, all based on acid whey.

These solutions ensure 100% yield from the milk that enters a strained fermented dairy process (figure 2).

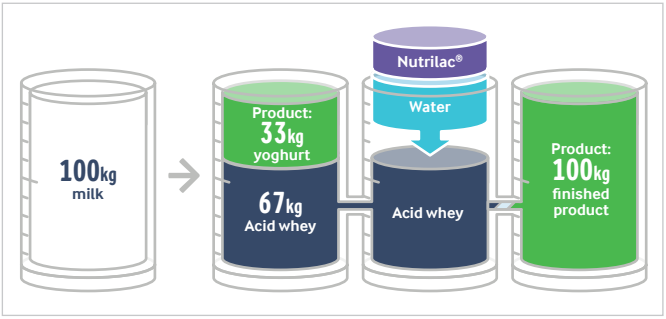

Figure 2: Nutrilac® proteins increase the yield from milk initially used in, for example, Greek yoghurt production from 33% to 100%

Stability performance in application trials

We have compared phase separation in acid whey drinks containing Nutrilac®, skimmed milk powder (SMP) and whey protein concentrate (WPC) at levels equivalent to 3% protein (figure 3). The results show that SMP samples start to separate almost immediately in storage. This is largely due to the high level of casein. Although casein is heat stable at neutral pH, it is particularly vulnerable to precipitation at a lower pH when subject to heat treatment. Some precipitation is also noticeable in the sample with WPC. In the acid whey drink with Nutrilac®, however, phase separation remains at an extremely low level throughout storage.

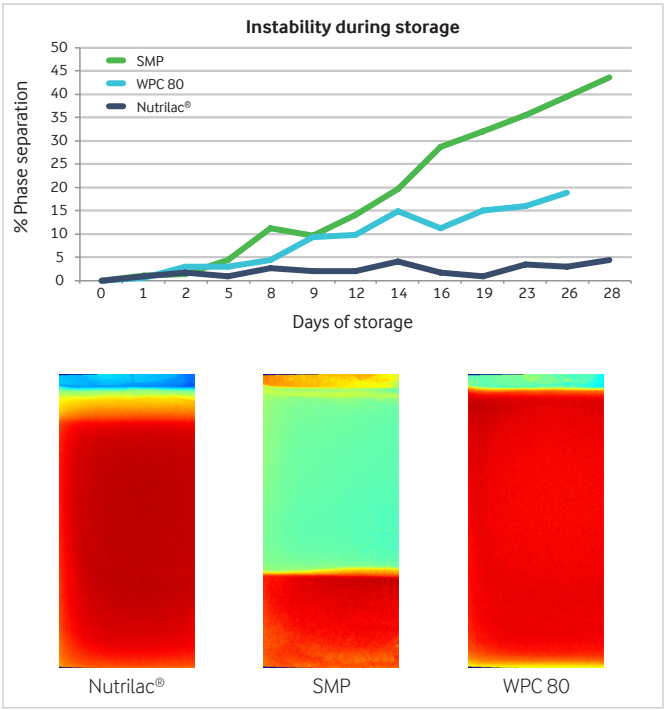

Figure 3: Phase separation in fermented acid whey drinks during storage. Stability measurements were taken using a VideometerLiq spectral imaging instrument. Phase stabilities/sedimentation are coloured yellow, the syneresis layer is coloured green, and homogeneous mass is coloured red

Long-life acid whey drinks

Similar tests were run with 50% acid whey long-life drinks, which require a more extreme heat treatment. These found that Nutrilac® was the most stable solution, showing the best tolerance of the tougher heat treatment and an extended storage period (figure 4).

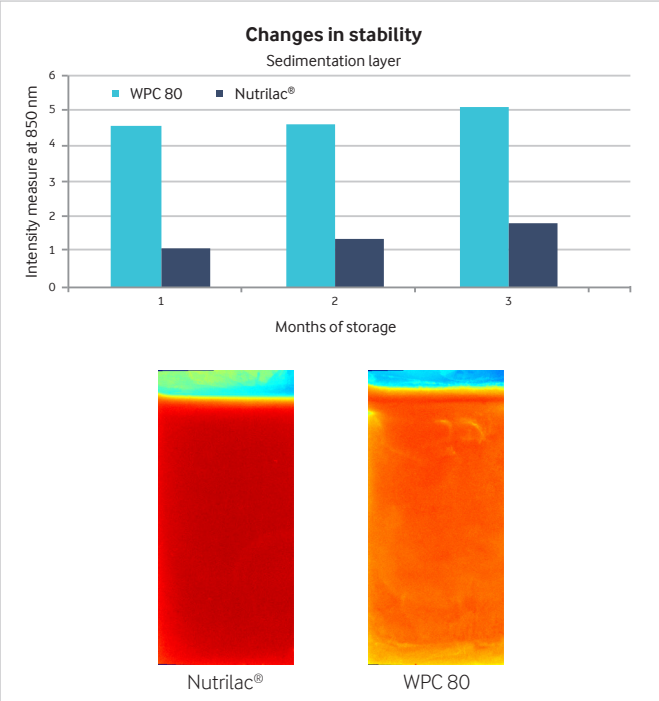

Figure 4: Development of sedimentation layer in long-life acid whey drinks during three months in storage. The VideometerLiq pictures show phase separation and sedimentation after three months. Whereas the sample with Nutrilac® remains stable, as shown by the primarily red colour, the sample with WPC is more orange. This colour change from red to yellow indicates instabilities during shelf life

Assesments of taste, texture and appearance

Sensory evaluation of dessert

We developed a dessert concept with 50% acid whey and Nutrilac® for production on a conventional yoghurt line. In a sensory evaluation, the finished product was found to have an appealing, shiny appearance with no hard gel, a refreshing taste and a smooth and creamy mouthfeel (figure 5).

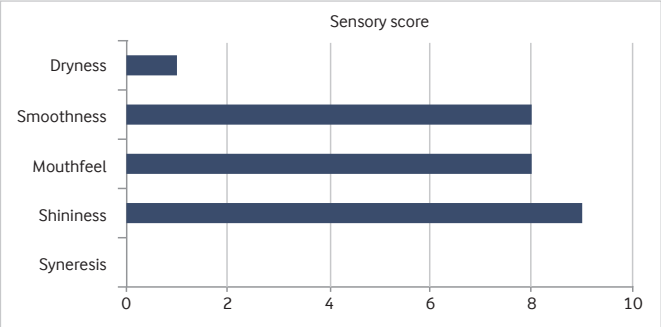

Figure 5: Sensory evaluation of acid whey dessert containing 50% acid whey and Nutrilac® proteins

Sensory evaluation of cream cheese

Traditional processing of cream cheese takes a time-consuming 16 to 20 hours. When acid whey is used in combination with Nutrilac® proteins, it is possible to produce a cream cheese product in 20 minutes. Our application trials have tested cream cheese with 48% acid whey and fat levels ranging from 15 to 25%.

A sensory evaluation compared acid whey cream cheese with milk-based cream cheese (figure 6). This showed that use of Nutrilac® proteins created a firm, smooth and spreadable texture which complements the aromatic, fresh taste of the acid whey.

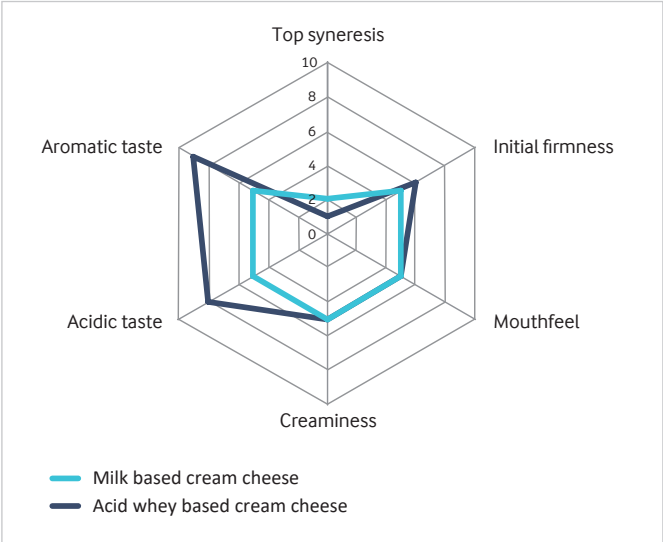

Figure 6: Sensory evaluation of traditional milk-based cream cheese and cream cheese with 48% acid whey and Nutrilac® proteins

Summary

Why settle for 33% yield from the milk in Greek yoghurt production, when you can both get 100% and expand your product range? The time has come for dairy companies to take a fresh look at the acid whey by-product of their strained fermented dairy process. Using acid whey in combination with selected whey proteins, there are many opportunities to create novel dairy products with high consumer appeal. As our application trials with Nutrilac® confirm, acid whey is a versatile, value-adding resource in fermented drinks, desserts and cream cheese.

Don't hesitate. Get in touch

Interested in learning more about adding value to acid whey? Just send us a mail, and we'll get back to you as soon as possible. Write to dairy@arlafoods.com

ASK US FOR: samples, recipes, application support

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