Exploring the options

Acid whey from yogurt for pickling cornichons and seasonal variations in milk production, are some of the 19 reviews in the *International Journal of Dairy Technology* 76(3). Andrew Wilbey reports

In this 80th anniversary year of the Society of Dairy Technology, its *International Journal of Dairy Technology* has increased its impact factor to 4.4 and maintained its place as the highest-rated milk processing journal. Virtual issues on heat processing and energy efficiency, plus celebrating World Food Safety Day have also gone online, an introduction to the former virtual issue being included in the third issue of the journal.

A review of the technical solutions to mitigating the impact of seasonal variations in milk composition for cheddar cheese production was selected as the editor's choice for the third issue. Technological approaches included milk standardisation processes and calcium addition plus the use of predictive models for coagulation and curd cutting time. Rapid analysis is critical in providing the data for process management.

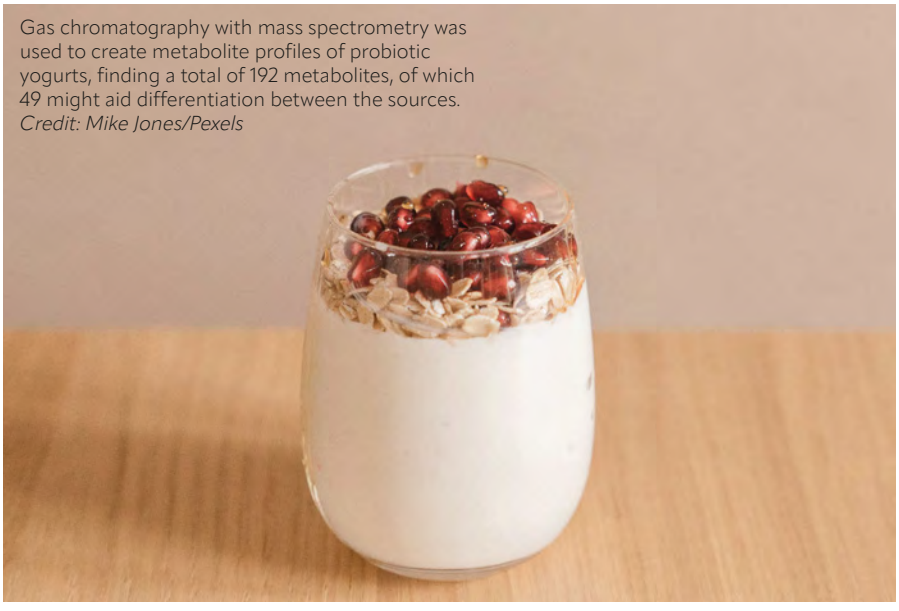
The second review covered the application of metabolomics in the dairy industry, from processing through distribution to the consumer, focusing on potential marker metabolites and metabolic mechanisms that may be associated with dairy product quality and traceability as well as intake monitoring. Identification of biomarkers, typically less than 1.5 kDa, is thus of prime importance and several candidates associated with different dairy products were discussed.

Non-bovine milks can be a significant source of probiotics in some markets. An overview of viability (survival at ≥107 cfu/g or mL), functionality and product quality issues were based primarily on fermented milks. Potential allergenicity can also be a factor in choices of milk source. Rate of fermentation was related to the buffering capacity of the milk proteins, which also affected the texture of the fermented products.

Milk

UHT milk can suffer from aggregation and/or gelation of its milk proteins on storage and some countries permit additives to minimise the incidence. In many markets the use of any additives is regarded with suspicion, so an assessment of consumers' perception was carried out in Brazil. It was found that most consumers did not read the labels on UHT milk and that there was confusion between the roles of stabilisers and preservatives, suggesting that better communication was needed. (This is not unique to Brazil.)

Fatty acid analyses were carried out for four breeds of native Indian cows and the Murrah breed of buffalo. Saturated fatty acids levels were higher in the Murrah buffalo and Karan Fries (a cross between Bos indicus and Bos taurus) milk than in those from Gir, Sahiwal and Tharparker breeds. The fat globule sizes were smaller with the indigenous cattle breeds than the buffalo.



Gas chromatography with mass spectrometry was used to create metabolite profiles of probiotic yogurts, finding a total of 192 metabolites, of which 49 might aid differentiation between the sources. *Credit: Mike Jones/Pexels*

Dairy chemistry

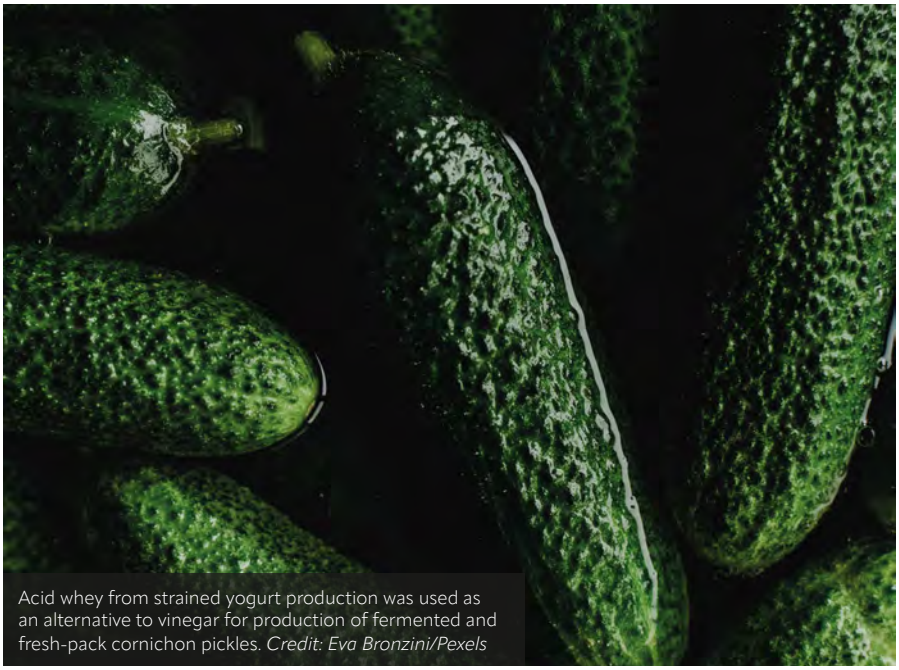
A study was made of the effects of changing calcium levels in buffalo milk. Decalcification was associated with changes in zeta-potential, casein size, colour and apparent viscosity. Chymosin mediated coagulation was slower in a minority of calcium-depleted milks, while acid coagulation was faster and at lower temperature for both calcium depleted and fortified milks. In both coagulation systems, calcium fortification increased firmness, consistency and cohesiveness.

Two papers reported the effects of proteases on angiotensin converting enzyme (ACE)-inhibitory activity in milk proteins, and thus with potential to reduce blood pressure. The first paper prepared a milk protein hydrolysate using two proteases, the hydrolysate retaining 80.5% ACE-inhibitory activity after handling in gastro-intestinal fluids. The second paper reported proteolysis of whey protein by an extract from the unripe fruit of *Bromelia heironymi*, native to Argentina. After 180 minutes the hydrolysate exhibited ACE-inhibitory activity.

Three bioactive proteins were separated from bovine colostrum and separately introduced to rabbits by either the oral route, intraperitoneal or intravenous injection. Depending on the route, different, sometimes opposite, inflammatory or anti-inflammatory effects were noted.

Dairy microbiology

Contaminated feed can lead to the secretion of the carcinogen aflatoxin M1 (AFM1) into milk. Incubation of spiked milk with *Bifidobacterium bifidu*m



Acid whey from strained yogurt production was used as an alternative to vinegar for production of fermented and fresh-pack cornichon pickles. *Credit: Eva Bronzini/Pexels*

and *Saccharomyces cerevisiae*, together or separately, reduced the level of AFM1 with the best results obtained from the mixed cultures when incubated at 37°C for 24 hours.

Campylobacteriosis is the most ommon European bacterial foodborne infection, with *Campylobacter jejuni* accounting for 88 per cent of confirmed cases. Some strains can remain viable in a non-culturable form, making identification difficult. A quantitative PCR method was developed to investigate the capacity of *Campylobacter spp.* to survive in milk, cheese and yogurt.

Some mesophilic lactic acid bacteria (LAB) are used as adjunct cultures in milk fermentations and cheese production. Cultures of *Lacticaseibacillus paracasei 90* (L90) were homogenised at high pressure (100 MPa) and the homogenate studied in vitro and in fermented milk and a semi-hard cheese.

Homogenisation resulted in some cell rupture and release of the cell contents, including proteases. With fermented milk, the addition of L90 homogenate resulted in raised lactate and lowered pyruvate. In the cheese, total LAB and enterococci were reduced and the soluble fractions were increased, whether the L90 was homogenised or not.

The probiotic *Limosilactobacillus plantarum grx16* was fed to rats and changes in gut digestive enzymes and inflammatory factors monitored. Gut amylase and lipase were inhibited, alleviating insulin resistance and lipid accumulation. This may alleviate non-alcoholic fatty liver disease.

Fermented milks

Gas chromatography with mass spectrometry was used to create metabolite profiles of probiotic yogurts, finding a total of 192 metabolites, of which 49 might aid differentiation between the sources. Differences between bovine and caprine milk were also demonstrated using principal components analysis and orthogonal partial least square discriminant analysis.

Cheese

Production of exopolysaccharide (EPS) by *Pediococcus acidilacti* was maximised by incubation for 10 hours at 37°C. Inclusion of the starter or its EPS was associated with a softer texture in Kareish cheese.

Curd plasticisation experiments were carried out on a part-skim, low-moisture, mozzarella cheese analogue. Samples processed with the continuous dipping-arms cooker-stretcher exhibited higher hardness values and were slightly less proteolysed on storage at 8°C than those processed with the batch twin-screw extruder. Hydrolysis of para-casein proceeded at the same rate and similar microstructures were observed under confocal laser scanning microscopy.

Fraudulent description is a potential problem where many artisanal producers of semi-hard cheese cannot be easily monitored. Examples of four Brazilian semi-hard cheeses were analysed using multivariate tools. Principal component analysis, hierarchical cluster analysis and other statistical techniques were used to sort the data, suggesting that the samples of Colonial and Minas Artisanal cheeses best fitted their denominations.

Mould ripened cheese in Turkey is often produced using traditional artisanal methods, open to contamination. Metagenomic analysis of 24 samples indicated that *Penicillium roqueforti* and *Pichia membranifaciens* were the dominant fungi, with lactobacilli and enterococci the most prevalent bacteria. Enterococcal antibiotic resistance was highest against rifampin, and two strains resistant to tetracycline.

A comparison was made between fresh, stored and thermised milks in the production of a soft cheese from pasteurised milk. Antioxidant activity was highest in the cheese from fresh milk, while those made from stored and thermised milk exhibited higher levels of malonaldehyde, an indicator of lipid oxidation. There was no significant difference in proteolysis.

Buffalo milk was standardised using a buffalo milk protein co-precipitate and made into paneer. Addition of the co-precipitate increased yield and recovery of total solids, with higher levels of protein and calcium and giving better shape retention and integrity on frying. Differences between the standardised and control paneers were also noted on texture profile analysis and evaluation of the microstructures.

Membrane processing

Calcium activity has a major effect on the casein micelles and hence the properties of milk, where typically two-thirds of the calcium is associated with the casein micelles. Skim milk was pre-treated with glucono-delta-lactone (GDL), lactic acid or citric acid then subjected to ultrafiltration (UF) at 10° or 55°C. Retentates pre-treated with citric acid had lower ionic calcium and higher apparent viscosity than those treated with GDL or lactic acid. Overall UF performance with any of the acidifications was poorer than with untreated skim.

Other applications

Acid whey from strained yogurt production was used as an alternative to vinegar for production of fermented and fresh-pack cornichon pickles. Those with acid whey had higher total solids and increased development of presumptive lactococci, indicating that acid whey could be a suitable pickling medium.

The 19 reports came with a report of the *SDT Spring Conference on Heat Processing and Energy Efficiency in Dairy Product Manufacture* and a letter on the topic of whether plant-based extracts should be called milk. DII