



Microbial quality of Greek yogurt and valorization of co-products

Duration: 2014 – 2018

Highlights

- Greek yogurt has won the favour of consumers and now makes up the largest segment of the yogurt market.
- The dairy industry is in need of comparative data on the stability and safety of these types of high protein content (HPC) yogurts, produced by centrifugation or ultrafiltration, as well as valorization strategies for co-products.
- Cold HPC products contain more probiotics, but their subsequent stability is affected by the strain and the HPC process.
- The survival rate of the sensitive probiotic strain (*Bifidobacterium longum* ssp. *longum* R0175) is not higher in HPC yogurt in comparison to traditional yogurt.
- The centrifugation process concentrates bacteria and curd, furthering survival of the resistant probiotic strain (*Lactobacillus helveticus* R0052).
- Mortality of the contaminant *E. coli* was higher in HPC yogurt produced through ultrafiltration while growth of the yeast *Kluyveromyces marxianus* was similar in HPC and traditional yogurts.
- The production of exopolysaccharides by lactic acid bacteria increased in the co-cultures of *Lactobacillus rhamnosus* and the yeast *Saccharomyces cerevisiae* in comparison to the monoculture, making it possible to obtain a bioingredient that is rich in polysaccharides from the lactic acid bacteria ultrafiltrate.
- The solid-state fermentation of whey permeate with wheat bran made it possible to increase the presence and bioaccessibility of the phenolic components and antioxidant activity of bioingredients.

Objectives

GENERAL OBJECTIVE: contribute to the advancement of knowledge of high protein content (HPC) yogurt, as well as enrichment processes and microbial communities that impact the quality and functionality of dairy products. The project aims to increase the energy efficiency of processes with the development of high value-added ingredients using co-products in the production of HPC yogurt.

Results and potential benefits

New knowledge:

Effect of the processes on the development of starter cultures, probiotics and contaminants, as well as on sensory characteristics during the storage of HPC yogurts:

- The survival rate of the sensitive probiotic strain (*Bifidobacterium longum* ssp. *longum* R0175) is not improved in HPC yogurt in comparison to traditional yogurt.
- The centrifugation process concentrates bacteria and curd, furthering survival of the resistant probiotic strain (*Lactobacillus helveticus* R0052).
- The mortality rate of the contaminant *E. coli* was higher in HPC yogurt produced through ultrafiltration while growth of the yeast *Kluyveromyces marxianus* was similar in HPC and traditional yogurts.

Development of high value-added ingredients using co-products:

- The production of exopolysaccharides in whey permeate is higher when using yeast and exopolysaccharide-producing lactic acid bacteria co-cultures.
- The combined fermentation of dairy and grain products produces a new ingredient that is richer in antioxidant activity.

New process

Eco-friendly design of a process for biological recycling of the whey ultrafiltrate to produce new bioingredients with prebiotic effects.



Results and potential benefits, continue...

Potential Benefits

- Increase the value of by-products and dairy products fermented with probiotics.
- Increase the energy efficiency of milk processing through biological recycling.
- Better choice of processes depending on the desired product (sensorial or microbiological attributes).
- Decreased energy use and reduced loss of co-products.
- Improved functionality of dairy products for consumer health.

Professionals trained

Andréanne Moineau-Jean, a Master of Science student, has acquired expertise in yogurt production and concentration processes; growth, survival and selective counting in milk, yogurt with lactic acid bacteria, probiotics, and contaminant microorganisms; physico-chemical analyses of milk and yogurt; and the sensory assessment of yogurt. Her professional interests include food processing through the use of microorganisms, the development of foods that are beneficial to health, improving food safety and preservation; and the valorization of co-products resulting from food processing. Her work on the contamination of Greek yogurt during storage earned her the title of star student-researcher of the month for February 2018, awarded by the Fonds de recherche du Québec - Nature et technologie (FRQNT).

Annalisse Bertsch, a PhD student, has acquired expertise in co-culture fermentation processes, bioingredient production, gene expression through RT-qPCR, the viability of strains through PMA-qPCR, and the valorization of food industry co-products. Her professional interests include research and development of products that are beneficial to health (prebiotics and probiotics), and the design and development of energy efficient technological processes.

The training of the two students was considered relevant by the company Biena specializing in the production of lactic and probiotic cultures because Andréanne has been working in the laboratory since graduation, while Annalisse is part of Industrial production team since July 2017.

For further information

The results were presented by Andréanne Moineau-Jean through posters at the Novalait Forum (June 2, 2016, Drummondville) and at IUFOST, 18th World Congress of Food Science and Technology (August 22–25, 2016, Dublin, Ireland). In 2018, the results will be presented by Annalisse Bertsch through an oral presentation and a poster at the Novalait Forum Techno.

One scientific article has been published to date: Moineau-Jean, A., Guévremont, E., Champagne, C. P., Roy, D., Raymond, Y., & LaPointe, G. (2017). Fate of *Escherichia coli* and *Kluyveromyces marxianus* contaminants during storage of Greek-style yogurt produced by centrifugation or ultrafiltration. *International Dairy Journal*, 72, 36-43.

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- Novalait

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