



Improving eco-efficiency in milk processing by optimizing the usage of milk components: the case of Greek yogurt

Duration: 2014 – 2018

Highlights

- Concentrated “Greek-type” yogurt has seen an exponential increase in consumption but has consequently generated acidic whey that is managed as residual matter.
- This environmental problem, the costs of development related to Greek yogurt production and its value to consumers raises questions about eco-efficiency (EE) in milk processing.
- This project allowed for a more specific comparison between the environmental impact (using a life cycle assessment (LCA) approach) of ultrafiltration before filtration (UF-MILK) and post fermentation (UF-YOG).
- The ultimate goal of the research is to develop decision-making tools for industrial dairy processors, based on life cycle assessment data and the notion of industrial ecology, in order to optimize the use of milk’s natural components.

Objectives

- Describe the impact of technological choices on process efficiency and on the use of milk components for a model Greek yogurt production sequence.
- Develop an analysis framework to assess the EE of the processing of Greek yogurt.
- Identify and assess the external channels for the valorization of co-products and industrial synergies.
- Develop and validate a modelling tool for environmental and economic impact assessments and an optimization tool based on the EE indicator for milk processing.

Results and potential benefits

Economic benefits

- **Increased productivity:** The experimental data generated on a pilot scale show that choosing the milk concentration process before fermentation (UF-MILK) allows for a better usage of milk components than if ultrafiltration is completed after the fermentation stage (UF-YOG). The absence of lactic acid in the UF-MILK co-product facilitates valorization of the milk solids present in the permeate.
- **Reduced production costs:** Volumic concentration factor used to concentrate milk has a direct effect on production costs as well as on the environmental impact of Greek yogurt. Moreover, a mapping of technological scenarios for Greek yogurt production (centrifugation vs. ultrafiltration) and of the channels for the valorization of co-products allowed us to develop simulations of matter and energy balances applicable to each scenario in Quebec’s industrial context.

Environmental benefits

- As milk production is responsible for approximately 80% of the impacts on the life cycle of Greek yogurt, a better use of processed milk components will create significant environmental benefits.
- The work will allow us to develop an eco-efficient methodology adapted to the specific characteristics of the dairy industry.

Social benefits

By optimizing the use of organic matter in the Greek yogurt value chain, the knowledge gained as part of this project will allow players in the industry to generate less waste and more value (principles of circular economy). This work addresses consumer concerns from a sustainable development point of view.



Professionals trained

Adriana Paredes-Valencia (MSc)

Holding a graduate diploma in sustainable development (France), Adriana has acquired practical experience in dairy research where she has utilized life cycle assessment (LCA) fundamentals in order to interpret her own data. Her professional interests are directly related to sustainable development in the food processing sector.

Catherine Houssard (PhD)

With a background in agri-food engineering, Catherine has worked in the industrial sector for over 15 years. Catherine has begun PhD research on the concept of energy efficiency in order to better adapt energy usage to the dairy industry. Her objective is to help develop new skills in energy efficiency and the operationalization of sustainable development concepts in the agri-food industry.

For further information

Group members will use different means of communication to reach enterprises that will be able to put the results of this research into application. The results will be presented at conferences (STELA Colloquium, Forum Techno, American Dairy Science Association, IDF Symposium) and published in scientific journals. The knowledge transfer tools available through Novalait, STELA (INAF) and the NSERC-Novalait chair's website will also be leveraged.

Financial contributions

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- Fonds de recherche du Québec – Nature et technologies
- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
- Novalait

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Contact persons

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