

Do mechanical treatments have an impact on the technological quality of milk?

Duration : 2012 – 2017

Highlights

This project aims to study the impact of mechanical treatments on the technological quality of milk intended for cheese production. The effects of light treatments (pumpage, skimming) and intense treatments (churning, high pressure homogenization) are also studied.

- Pumpage and skimming lead to a low level of flocculation of the milk fat globules and the absorption of a small quantity of surface proteins;
- The characteristics of casein micelles, coagulation properties and cheese yields are not influenced by milk pumpage and skimming conditions;
- High pressure homogenization of skimmed milk leads to the solubilization of colloidal calcium, reduces the size of casein micelles and increases their electric charge;
- Despite its effects on milk properties, high pressure homogenization was shown to have no impact on its coagulation ability and cheese yields;
- Churning leads to major modifications in the light cream phase (buttermilk) which significantly decreases its technological qualities;

The research that is currently underway aims to study the potential of partial homogenization of cheesemaking milk to modulate cheese characteristics.

Objectives

The general objective of the project is to demonstrate the effect of mechanical treatments on the physico-chemical properties of milk and its cheesemaking ability.

The specific objectives are to measure the effect of 1) pumpage; 2) skimming; 3) churning; 4) high pressure homogenization of skimmed milk; and 5) partial homogenization of whole milk.

Results and potential benefits

Cheesemakers are aware of the importance of optimizing the technological qualities of milk intended for cheese production. In a highly competitive environment, improving yields and controlling cheese composition is essential. Standardizing milk and mastering heat treatments have been the subject of many studies. In comparison, the impact of mechanical treatments on milk's cheesemaking ability has not received much attention.

Our work will make it possible to quantify the effect of mechanical treatments on the dispersion state of fats, the physico-chemical properties of casein micelles and the balance between the colloidal and soluble phases. Despite the changes observed and the preciseness of

analysis methods, no significant impacts on the coagulation ability of milk or cheese yields have been recorded. The only exception concerns the churning of cream, which produces buttermilk whose fractions' technological qualities are inferior to those of milk.

The next portion of the project aims to evaluate the partial homogenization of cheesemaking milk as a control tool for cheese composition and characteristics. The presence of a fraction of homogenized fat in milk will modify the structural organization of the curd, its syneresis and the cheese's properties (composition, texture, melting properties).

Contact persons

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Professionals trained

Marie-Pierre Gauvin (PhD)

Expertise acquired:

- Production and fractioning of buttermilk;
- Dosage techniques;
- Analysis techniques (electrophoresis, high-performance liquid chromatography (HPLC), inductively coupled plasma (ICP), granulometry, rheology);
- Coagulation kinetics; characteristics of rennet gels; cheese production in a model system.

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Expertise acquired:

- High pressure homogenization;
- Dosage techniques;
- Analysis techniques (electrophoresis, high-performance liquid chromatography (HPLC), inductively coupled plasma (ICP), granulometry, rheology);
- Coagulation kinetics; characteristics of rennet gels; cheese production in a model system.

For further information

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

Financial contribution

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- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec
- Novalait

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