



## Screening of Lactic acid bacteria to produce sustainable fermented whey-based drinks

Marine Penland, Marie-Bernadette Maillard, Fabienne Garnier-Lambrouin,  
Sandrine Parayre, Nadine Leconte, Florence Valence, Geneviève  
Gésan-Guiziou, Stéphanie-Marie Deutsch

### ► To cite this version:

Marine Penland, Marie-Bernadette Maillard, Fabienne Garnier-Lambrouin, Sandrine Parayre, Nadine Leconte, et al.. Screening of Lactic acid bacteria to produce sustainable fermented whey-based drinks. 36th EFFoST International Conference 2022, Nov 2022, Dublin, Ireland. , 2022. hal-03854004

**HAL Id: hal-03854004**

**<https://hal.inrae.fr/hal-03854004>**

Submitted on 15 Nov 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0  
International License



# Screening of Lactic Acid Bacteria to produce sustainable fermented whey-based drinks

Marine PENLAND<sup>1</sup>, Marie-Bernadette MAILLARD<sup>1</sup>, Fabienne LAMBROUIN<sup>1</sup>, Sandrine PARAYRE<sup>1</sup>, Nadine LECONTE<sup>1</sup>, Olivier COUSIN<sup>2</sup>, Florence VALENCE<sup>1</sup>, Geneviève GÉSAN-GUIZIOU<sup>1</sup> and Stéphanie-Marie DEUTSCH<sup>1</sup>

<sup>1</sup> STLO, INRAE, Institut Agro, Rennes, France – <sup>2</sup> SODIAAL International

## CONTEXT & OBJECTIVE

Little known by consumers, cheese whey is the watery part obtained after milk curdling in cheese-making. With up to 9 L obtained for 1 kg of cheese produced, whey constitutes a major by-product of dairy industry. It mostly contains water but also lactose, minerals, vitamins (B6, B1, B12) and high-quality proteins. Despite these obvious nutritional qualities, the sour and salty taste of whey makes it not appealing to the consumer and restricts its direct consumption or use in food. For this reason, whey has long been poorly valorized and mainly used as feedstock for pigs or discarded. Nowadays, valorization rely on whey protein extraction/purification by heavy industrial process to obtain value-added food ingredients. However, these processes are only applicable to some cheese wheys, are energy-consuming and mostly concern large-scale dairy plants leaving small ones out of the system. As part of FAIRCHAIN project, we aimed at developing whey-based drinks, as alternative whey valorization, using microbial fermentation to preserve whey while also improving its native sensory properties.

This study explores the ability of Lactic Acid Bacteria (LAB) to ferment and acidify different types of whey and obtain the best aroma profiles for the drinks.

## EXPERIMENTAL DESIGN

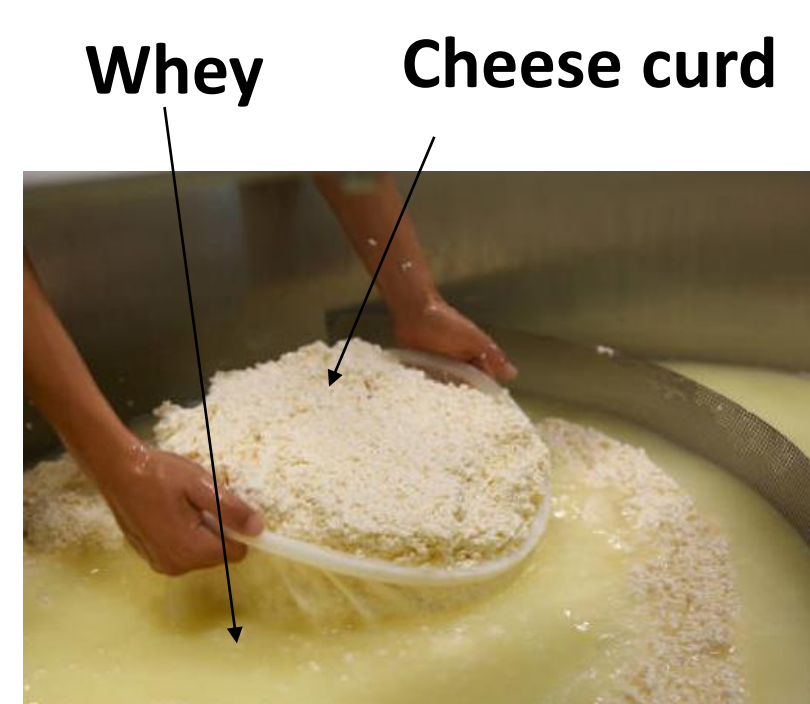
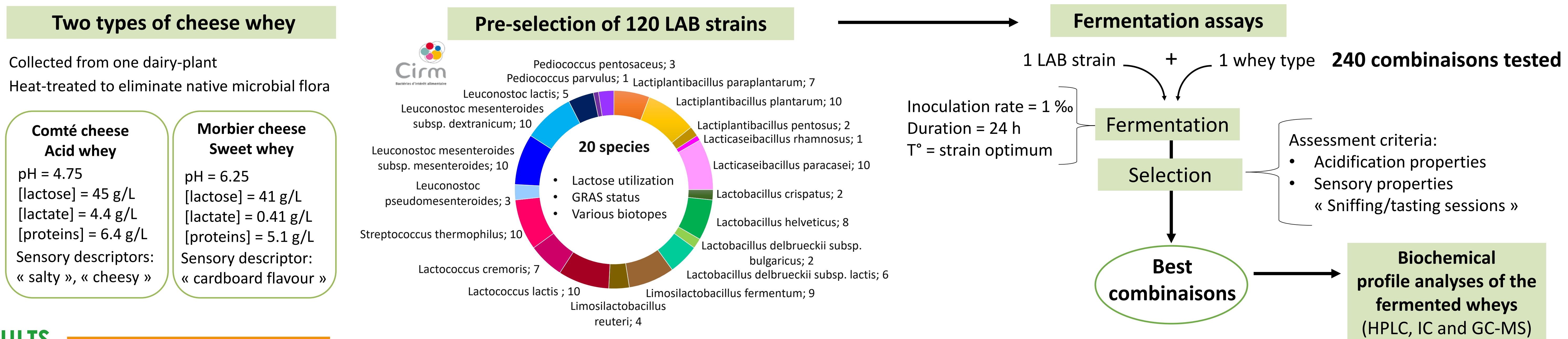
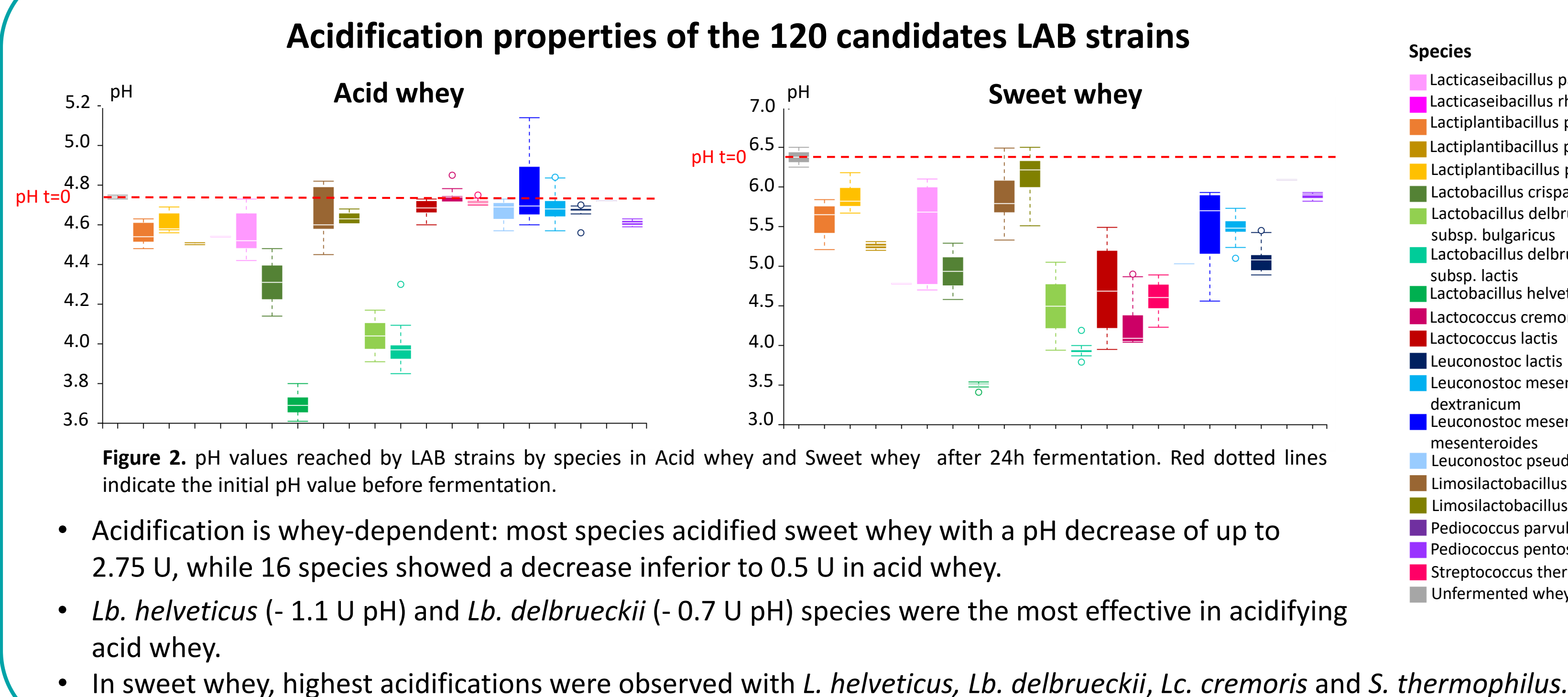


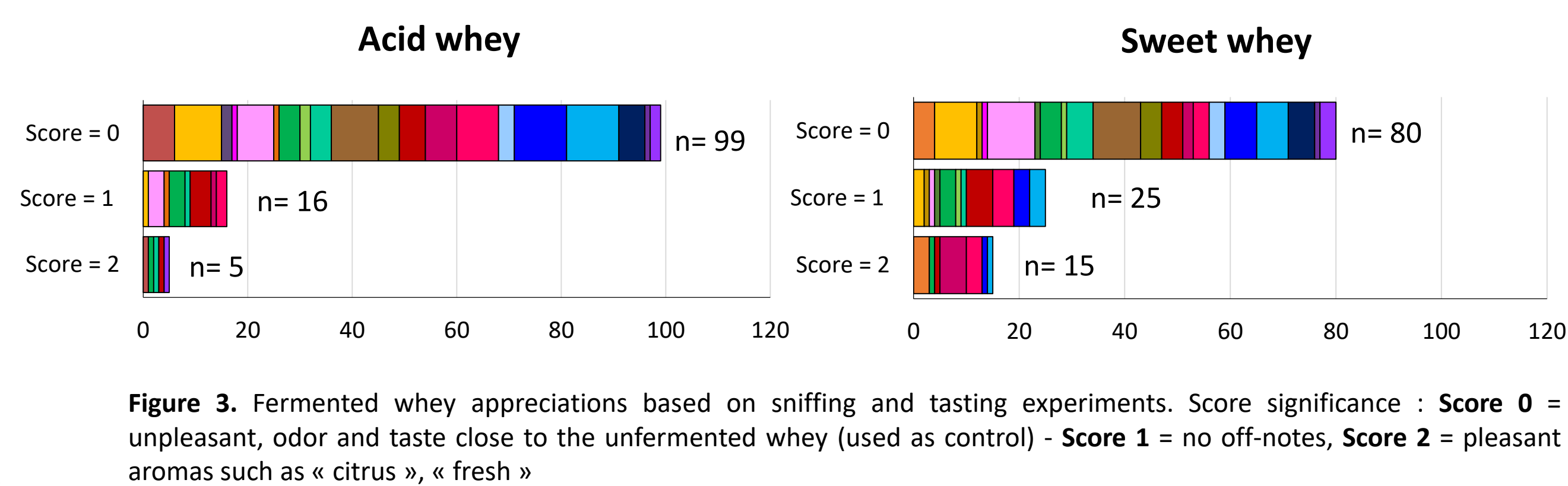
Figure 1. Separation of curd (coagulated milk) and whey during artisanal cheese-making.

## RESULTS

### Are LAB strains able to ferment acid and sweet wheys?



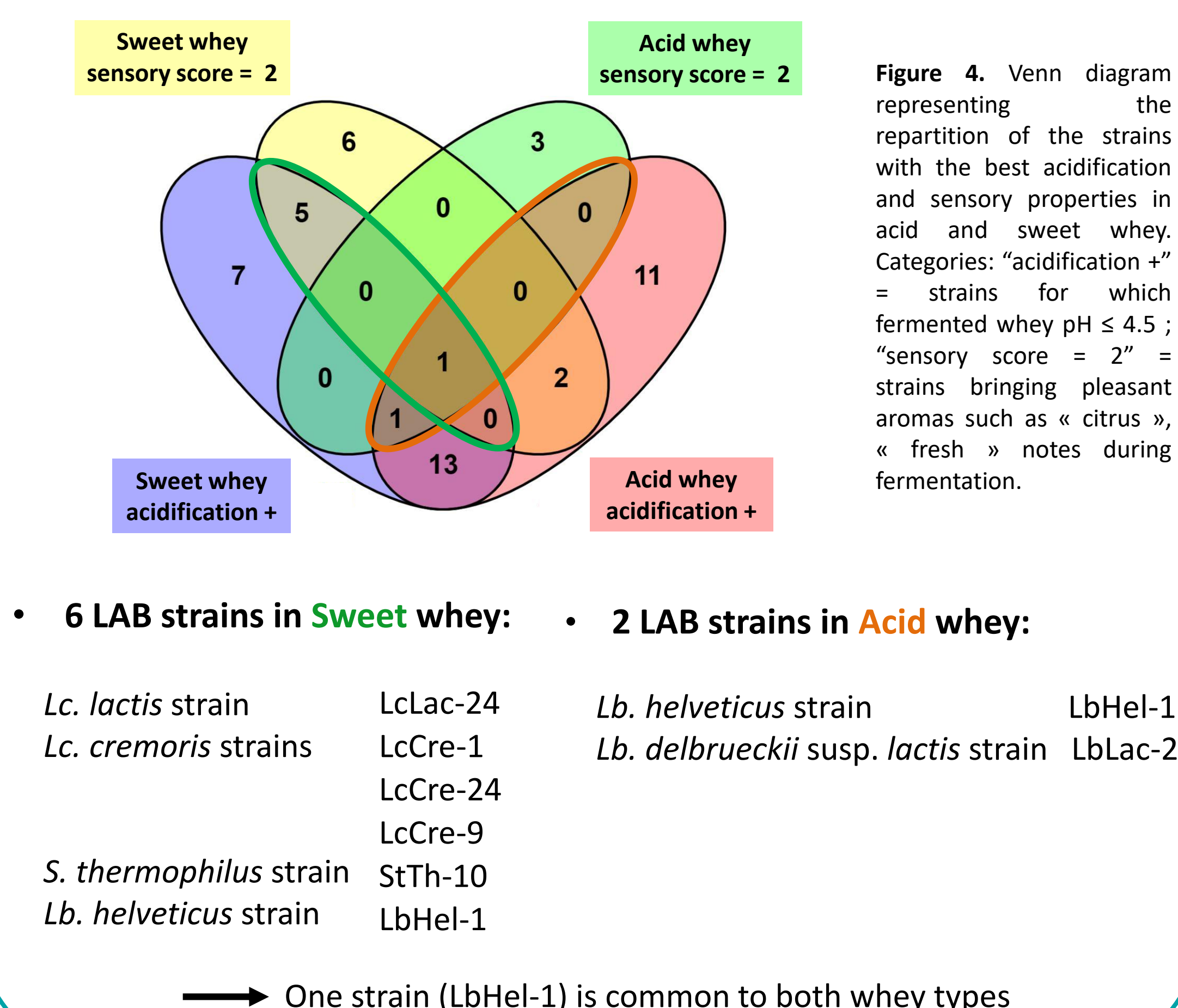
### Sensory properties of the wheys fermented with the 120 LAB strains



- Only 4 % and 12.5 % of strains improved taste in acid and sweet whey respectively.
- In acid and sweet wheys, the strains with the highest sensory score (score =2) belonged to 5 and 7 species respectively, revealing that sensory profiles of fermented whey are strain-dependent.

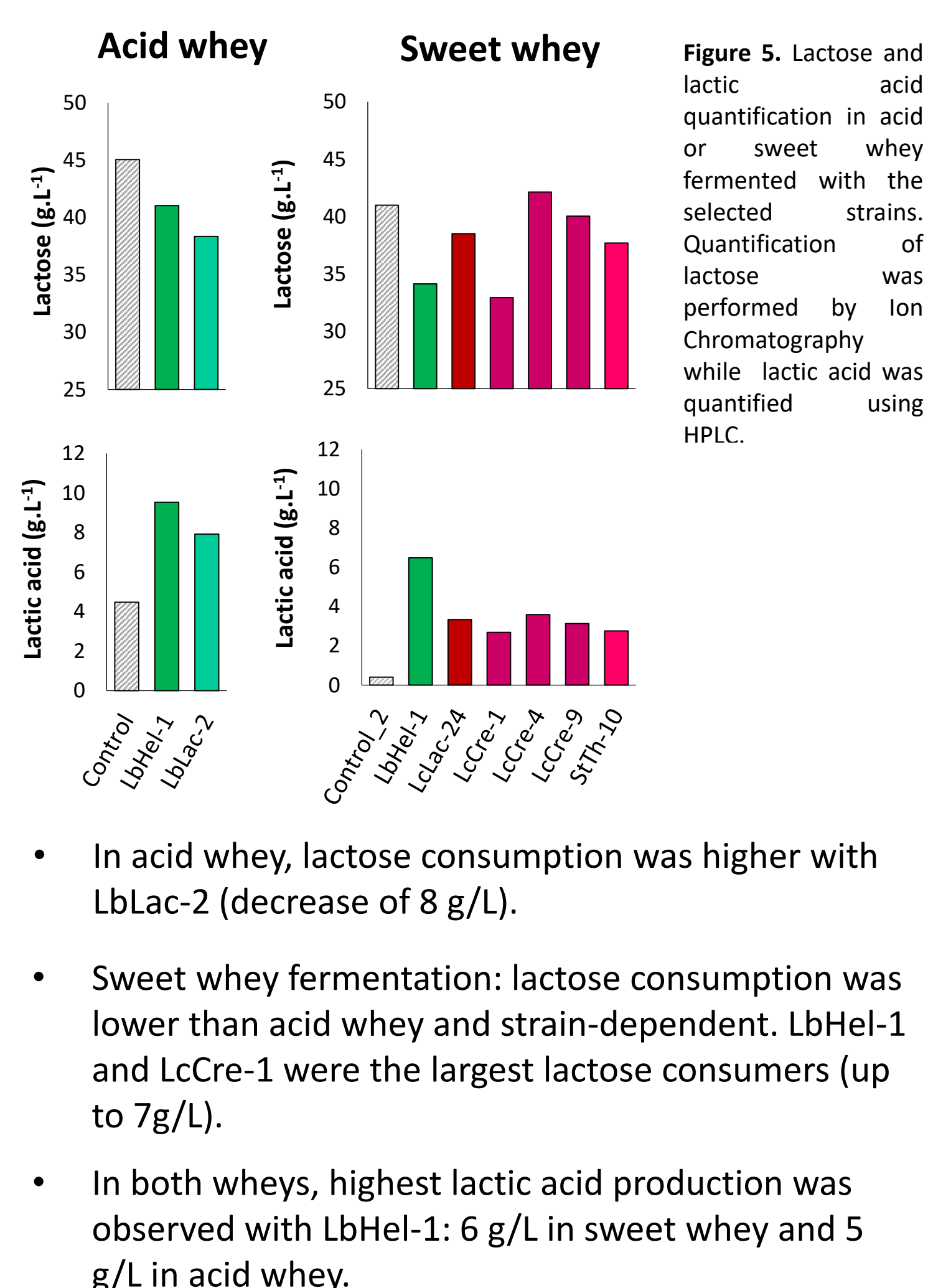
### Which strains are the best candidates for each whey fermentation?

#### Selection of LAB strains based on their acidification properties and the fermented whey sensory profiles

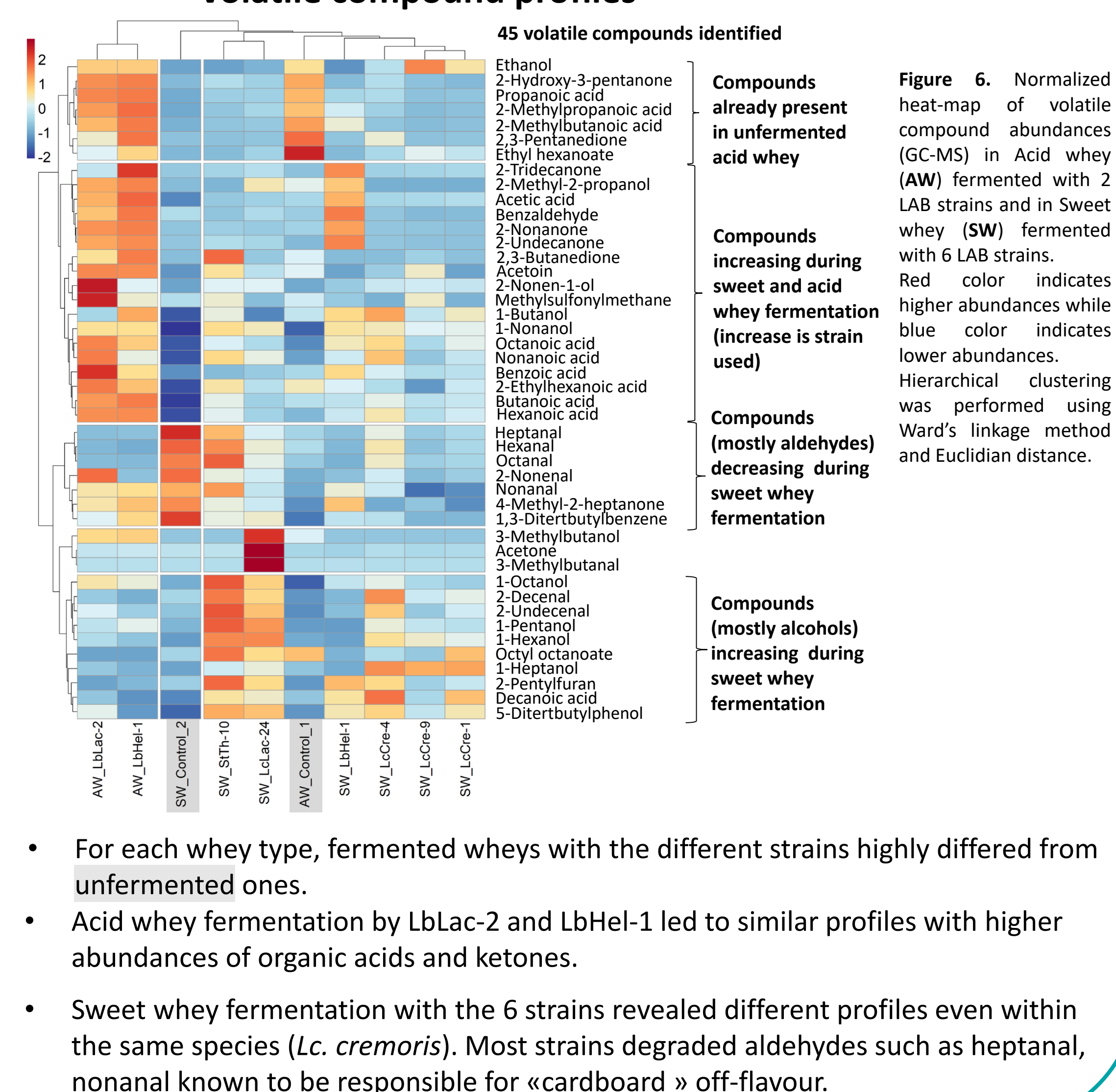


### What is the biochemical profile of the fermented wheys?

#### Lactose and lactic acid concentrations



#### Volatile compound profiles



## CONCLUSION AND PERSPECTIVES

- Lactic Acid Bacteria are able to ferment both acid and sweet whey. However, fermentation outcomes are strain-dependent and due to its low initial pH, fewer strains satisfyingly acidified acid whey.
- Two and six LAB strains were identified as good candidates for drink development in acid and sweet whey, respectively. One *Lb. helveticus* strain, namely LbHel-1, showed promising results on both types of whey.
- Biochemical analyses of the fermented wheys revealed that fermentation considerably changed sugar and aroma profiles. Adequate strain selection thus allowed to obtain a fermented whey with acceptable sensory profile. Aromatization experiments are currently carried out to further improve the taste of the fermented drinks.