
DTU

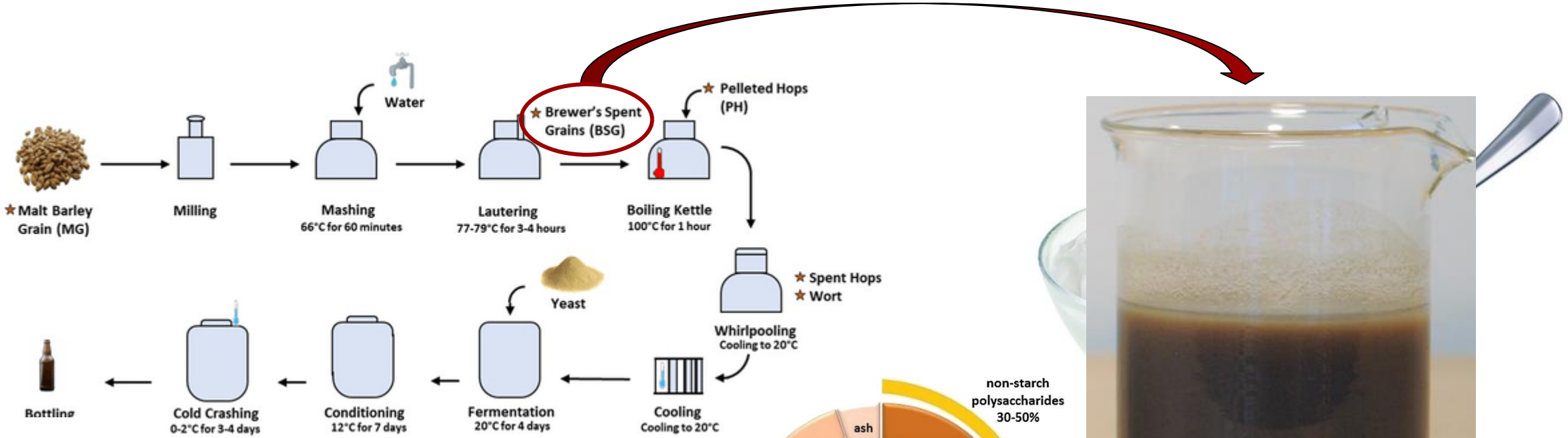
Tailoring a starter culture for a plant-based dairy alternative from a side-stream.

From brewery waste to new taste

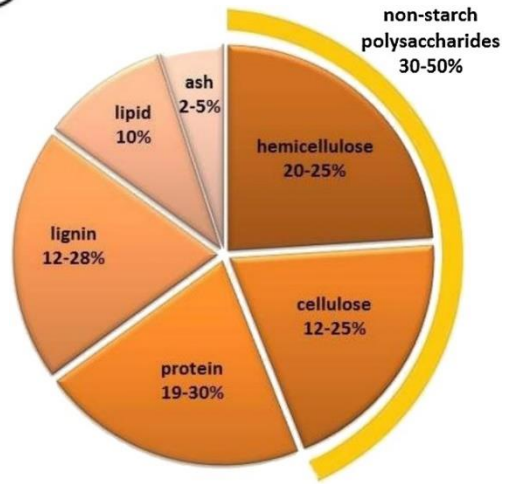
- EIT Climate KIC project (2019)
- Creating plant-based fermented dairy-alternative
- Using a waste stream from brewing industry
- Utilizing our in-house strain collection

Climate-KIC is supported by the EIT, a body of the European Union

Brewer's Spent Grain (BSG)



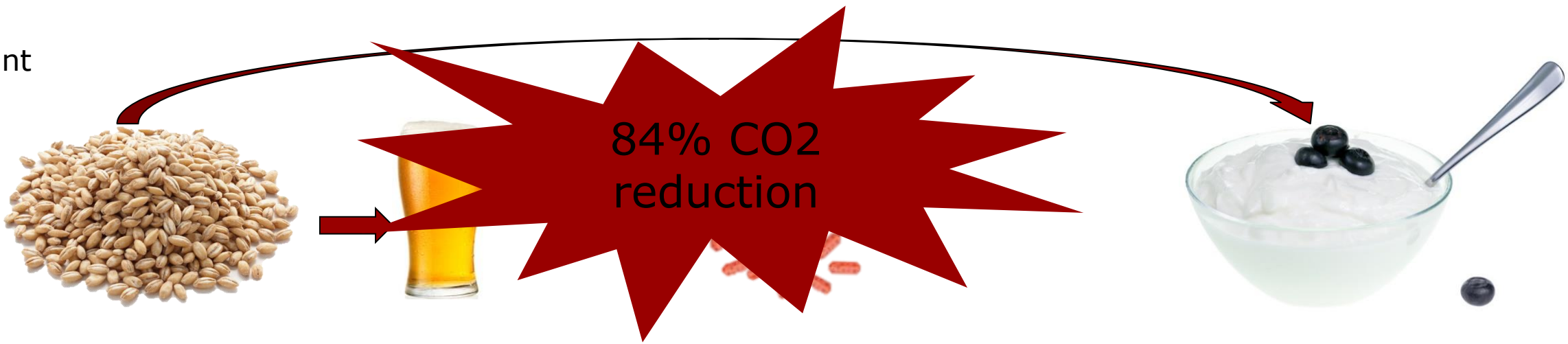
- 39 mio tons BSG produced annually
- 85% of total byproducts in brewing
- Low value (~1€/ton)
- Often discarded as waste
- Potentially high nutritional value



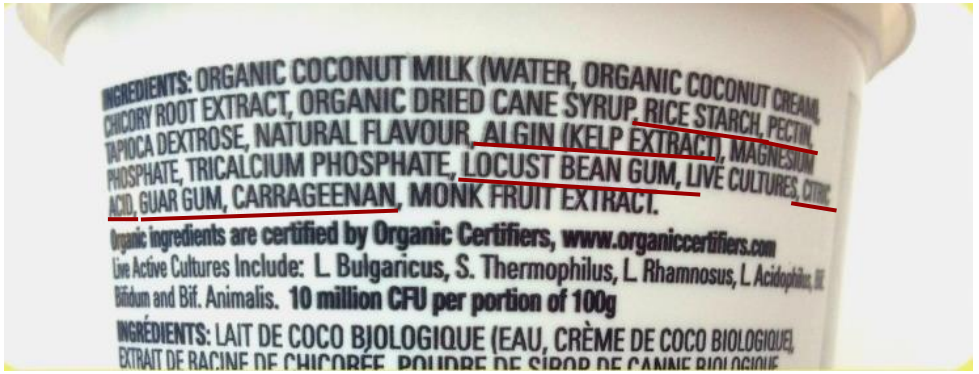
Dairy vs Plant

Dairy

Plant



Plant-based dairy alternatives are on the market but !!!



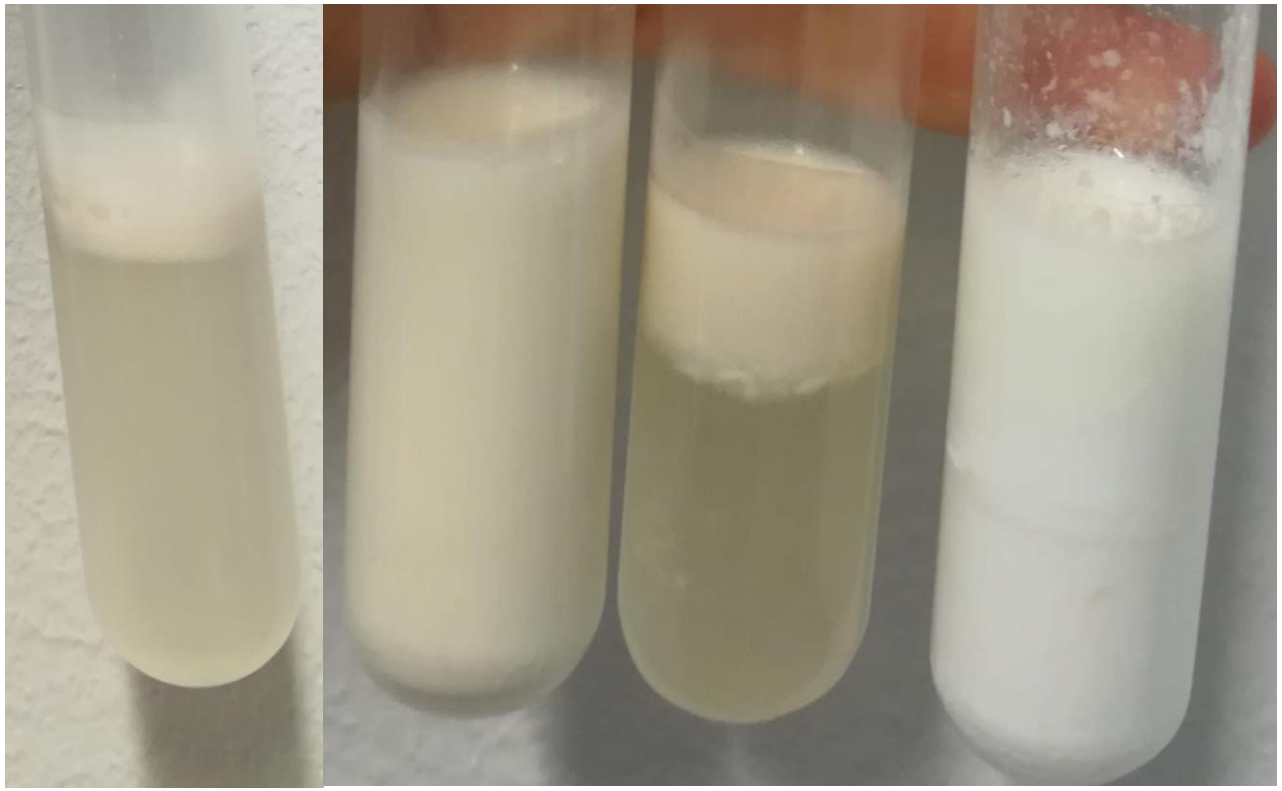
The ingredients list is long and taste is not there yet !

Plant-based dairy alternatives are on the market but !!!

Texturization in plant bases was tested with conventional dairy starter culture.

Texturization seems to be dependent on protein content

Conventional starter culture was unable to create the same texture in milk and plant base

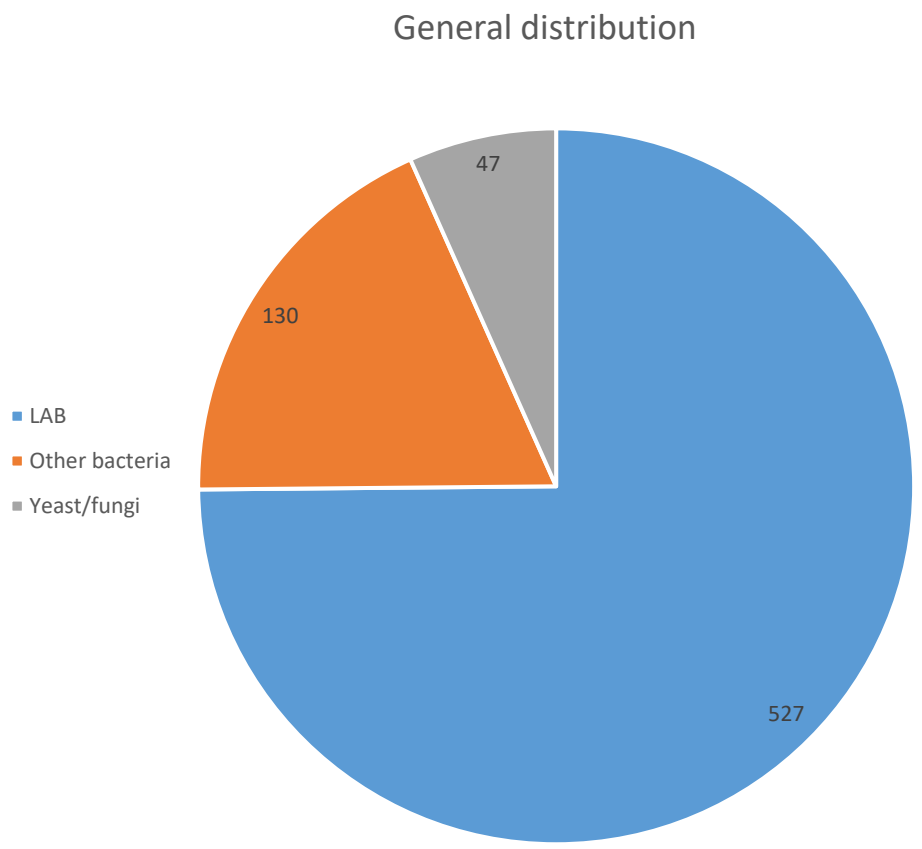


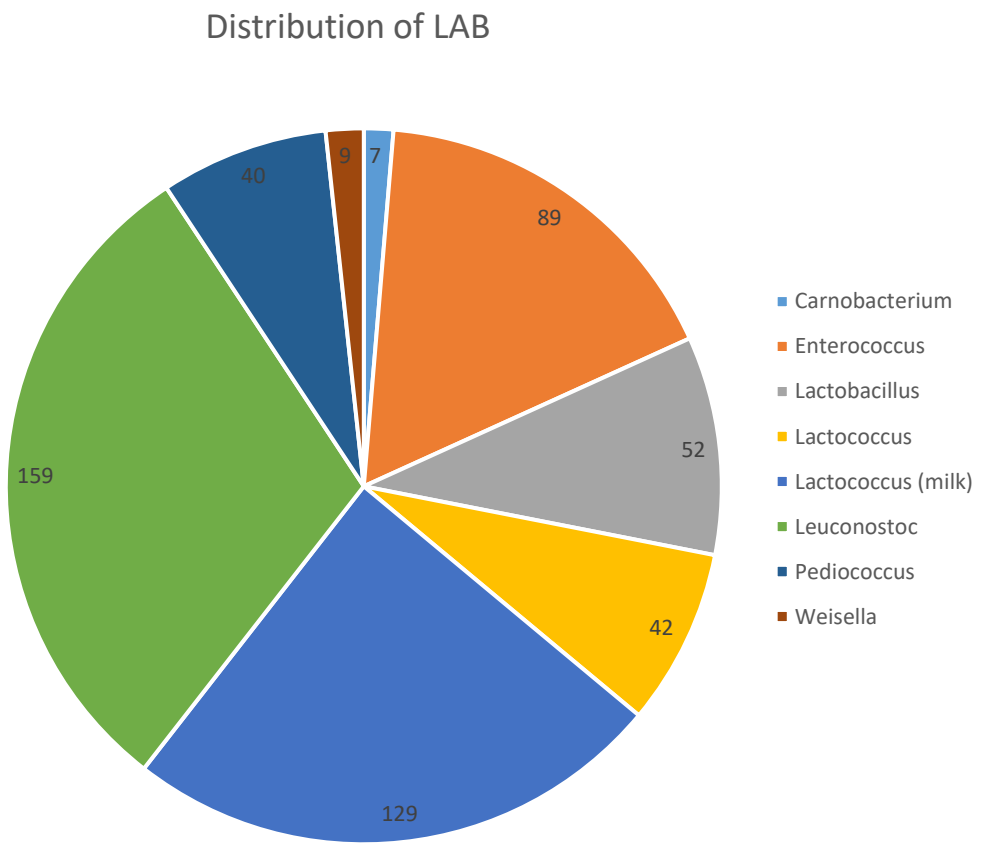
	RICE	**SOY**	OAT	**MILK**
Protein content	0,1 %	3,7 %	0,3 %	3,4 %

Hypothesis

- The catabolism of plant carbohydrates and proteins are key to food fermentation.
- Conventional starter cultures with LAB is unable to ferment plant bases, in a way that creates taste and texture comparable to dairy products such as yoghurt.
- Plant isolated LAB strains encode novel enzymatic activities which could enable production of plant-based, dairy-like alternatives.

DTU Strain Collection





Criteria for candidate selection

Primary requirements

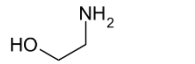
- QPS
- Biogene amine
- Antibiotic resistance
- Stress tolerance
  - Salt
  - pH
  - Temp
  - Bile salts

Secondary requirements

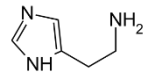
- Carbohydrate utilization
- Acidification capabilities
- Flavor production
- Curd formation (Reology)

European Food Safety Authority

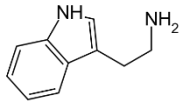
Qualified Presumption of Safety



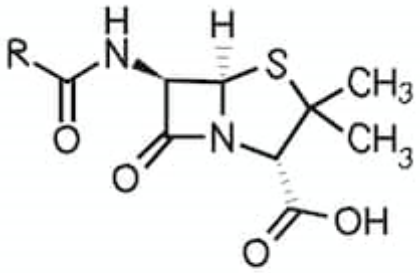
Ethanolamin



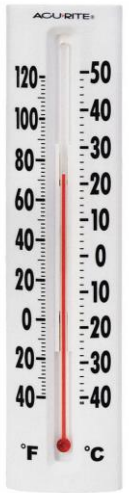
Histamin

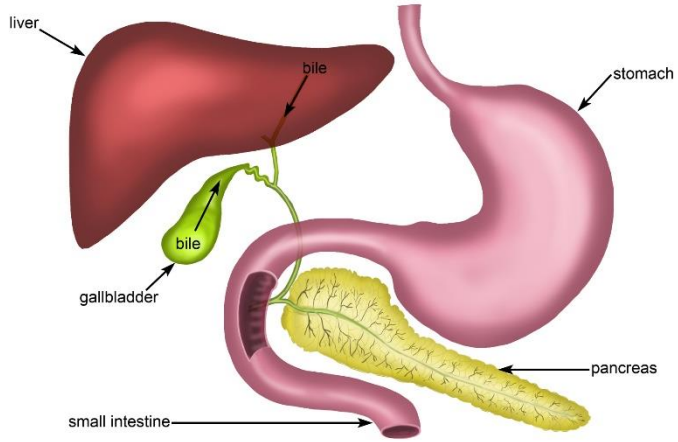


Thryptamin



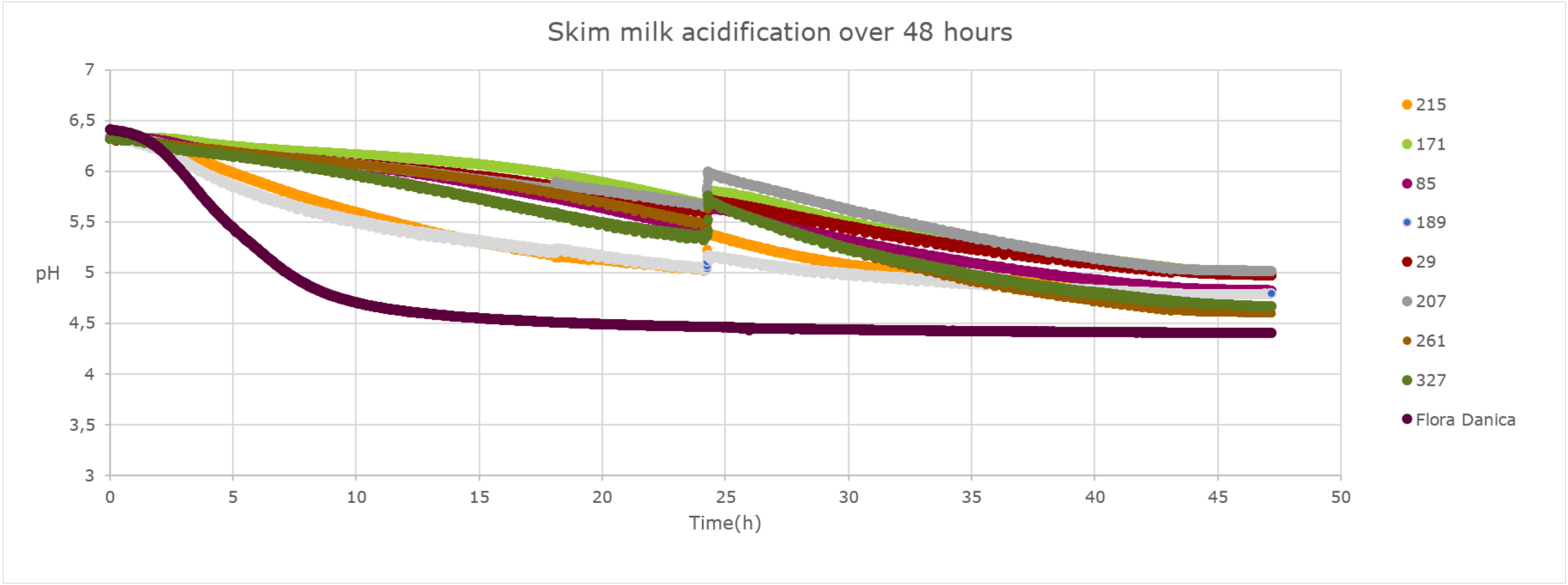
Penicillin





	MG1363	85	171	189	215
Control (negative)					
Glycerol					
Erythritol					
L(+)-Arabinose					
Ribose					
D(+)-Xylose					
Galactose					
D(+)-Glucose					
D(-)-Fructose					
D(+)-Mannose					
meso -Inositol					
Mannitol					
Sorbitol					
alfa-Methyl-p-mannoside					
alfa-Methyl-D-glucoside					
N -acetyl-glucosamine					
Amygdalin					
Arbutine					
Esculine					
Salicine					
D(+)-cellubiose					
Maltose					
Lactose					
D(+)-Melibiose					
Saccharose					
D(-)-Trehalose					
Inulin					
Melezitose					
D(+)-Raffinose					
Starch					
Glycogene					
Xylitol					
Beta-Gentiobiose					
D-Turanose					
D-Lyxose					
D-Tagatose					

Full conversion
Some conversion
No conversion

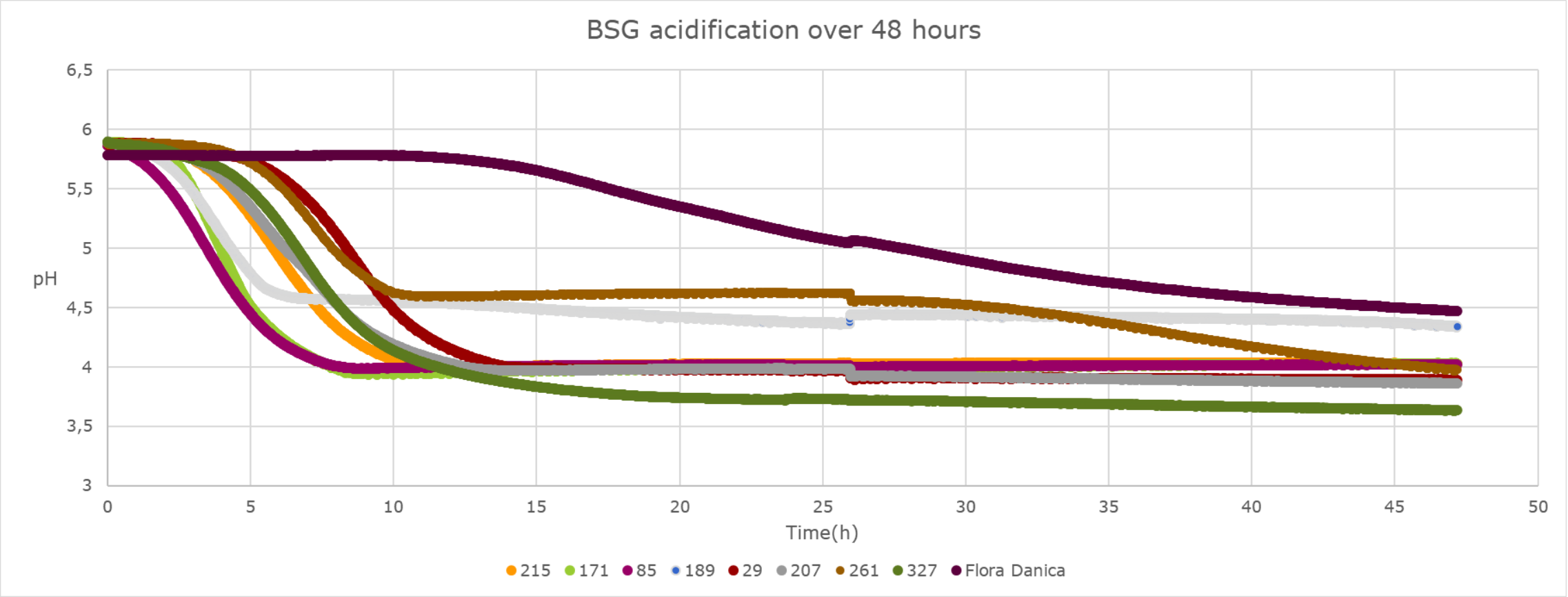


Cultures:

- Lactococcus:
  - 215, 171, 85, 189
- Lactobacillus:
  - 29, 207, 261, 327
- Flora Danica®

Fermentation conditions:

- Time: 48 hours
- Temperature: 30 ° C



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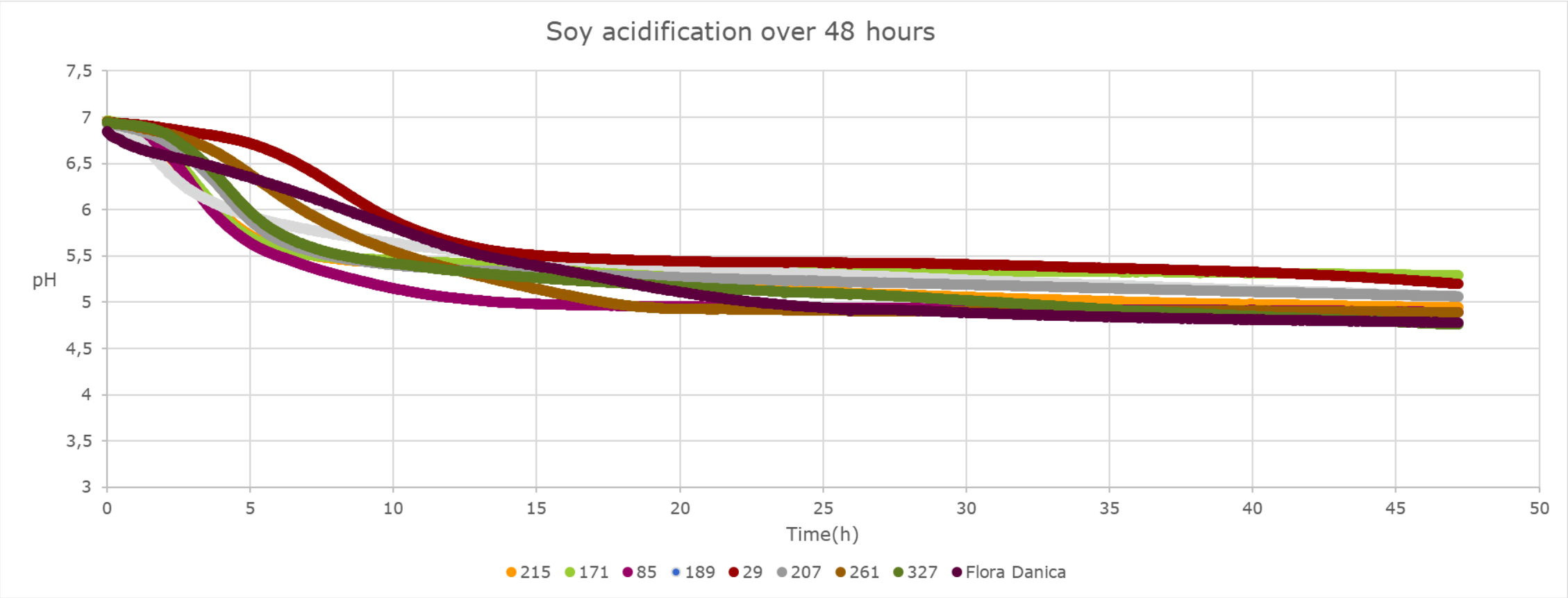

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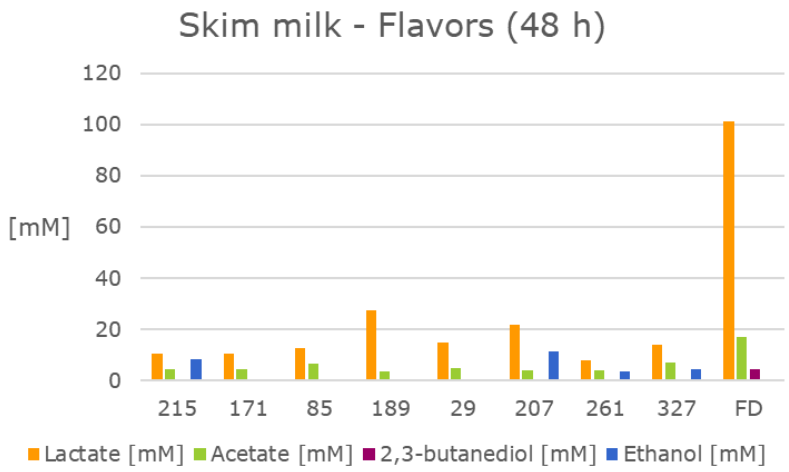
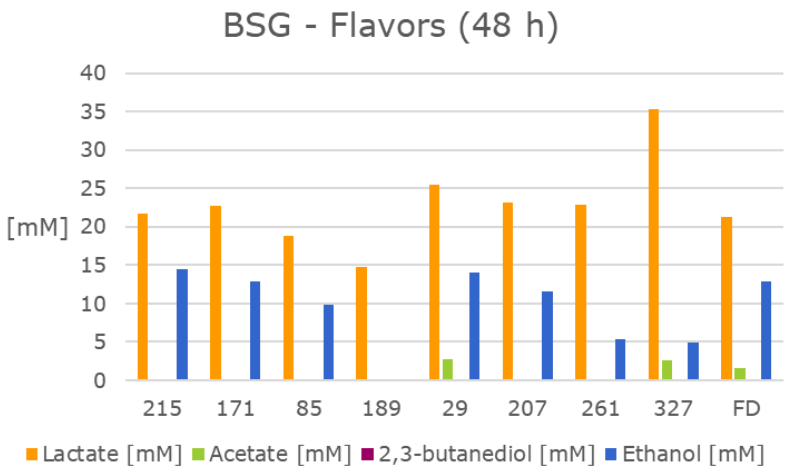
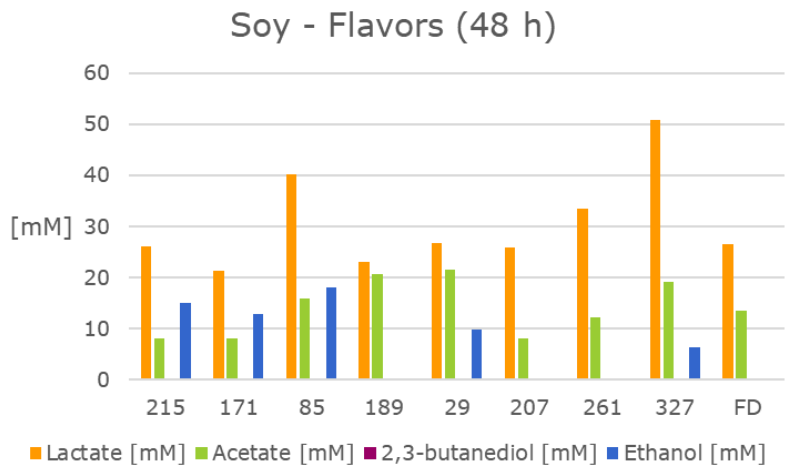
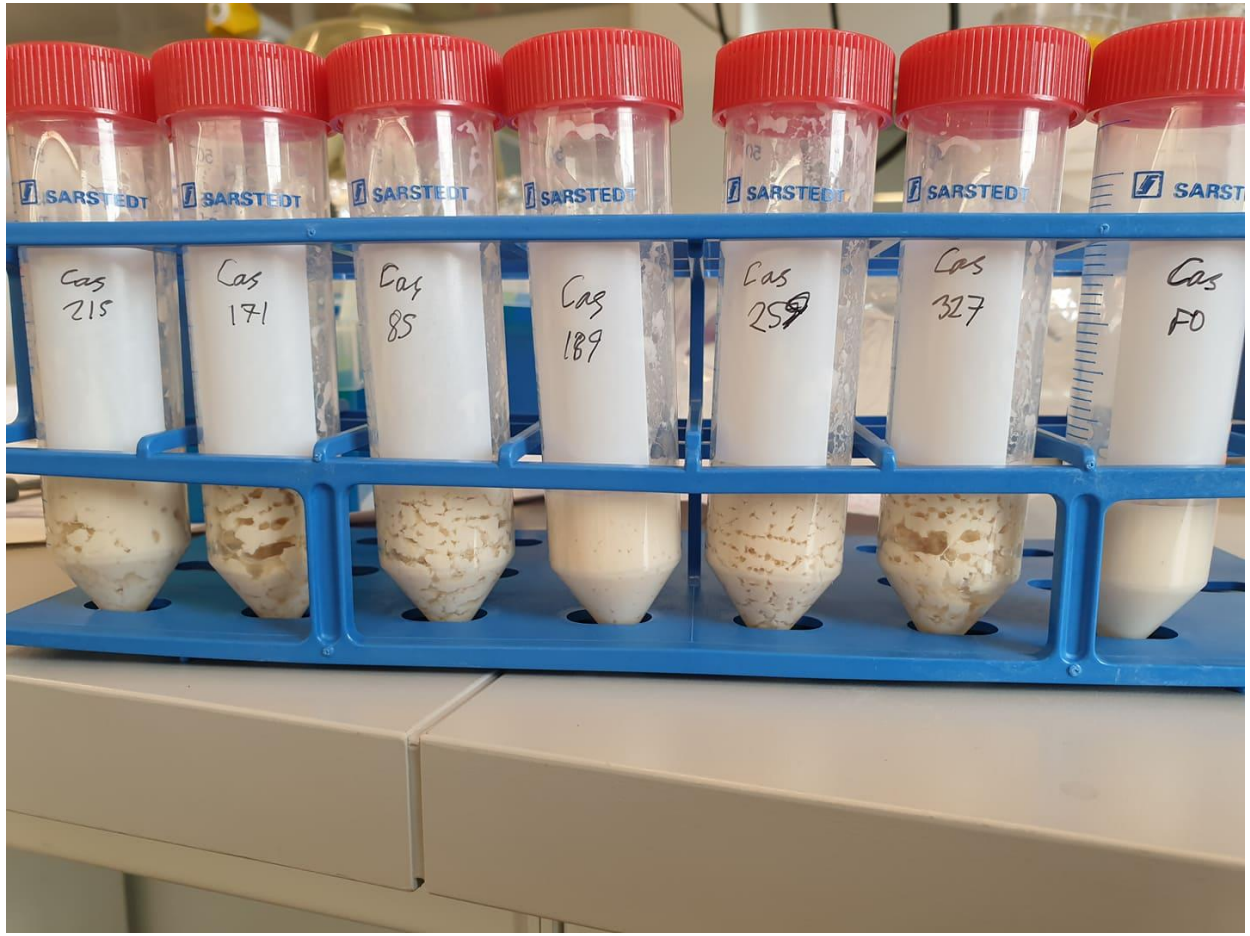
Flavor profile







Curd formation in plant-base



Low emission yoghurt made from waste BSG

- Made with a mixed culture selected from our strain collection

This story have received a lot of attention from national media as well as international media

Danske forskere laver vegansk yoghurt ud af ølrester

Forskere på DTU har i et projekt sammen med Carlsberg, Naturli' og Novozymes identificeret danske mælkesyrebakterier fra planter, som gør det muligt at lave en vegansk yoghurt ud fra kun tre ingredienser.

DTU-forskere laver vegansk yoghurt ud af ølrester

... og syrner den med mælkesyrebakterier fra den danske natur.

Vegansk 'yoghurt' lavet på mælkesyrebakterier fra planter

Fødevarer, fisk og landbrug · Fødevareproduktion · Bakterier og mikroorganismer · Fødevareteknologi

Forskere på DTU er gået i gang med at lave en bæredygtig vegansk yoghurt, der udnytter spildprodukter fra fødevareindustrien.

Forskerne fra DTU er gået sammen med virksomhederne Carlsberg, Naturli' og Novozymes for at fremstille den bæredygtige og veganske yoghurt.

Vegan 'yogurt' made with lactic acid bacteria from plants

Posted January 15, 2020

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Researchers at DTU have identified lactic acid bacteria from Danish plants, which can be used to make a 100% vegan 'yogurt' with just three ingredients.

Further research on yoghurt production

- Fine-tuning smell, taste, and texture
- Increase content of BSG
- Test starter cultures with more than two strains

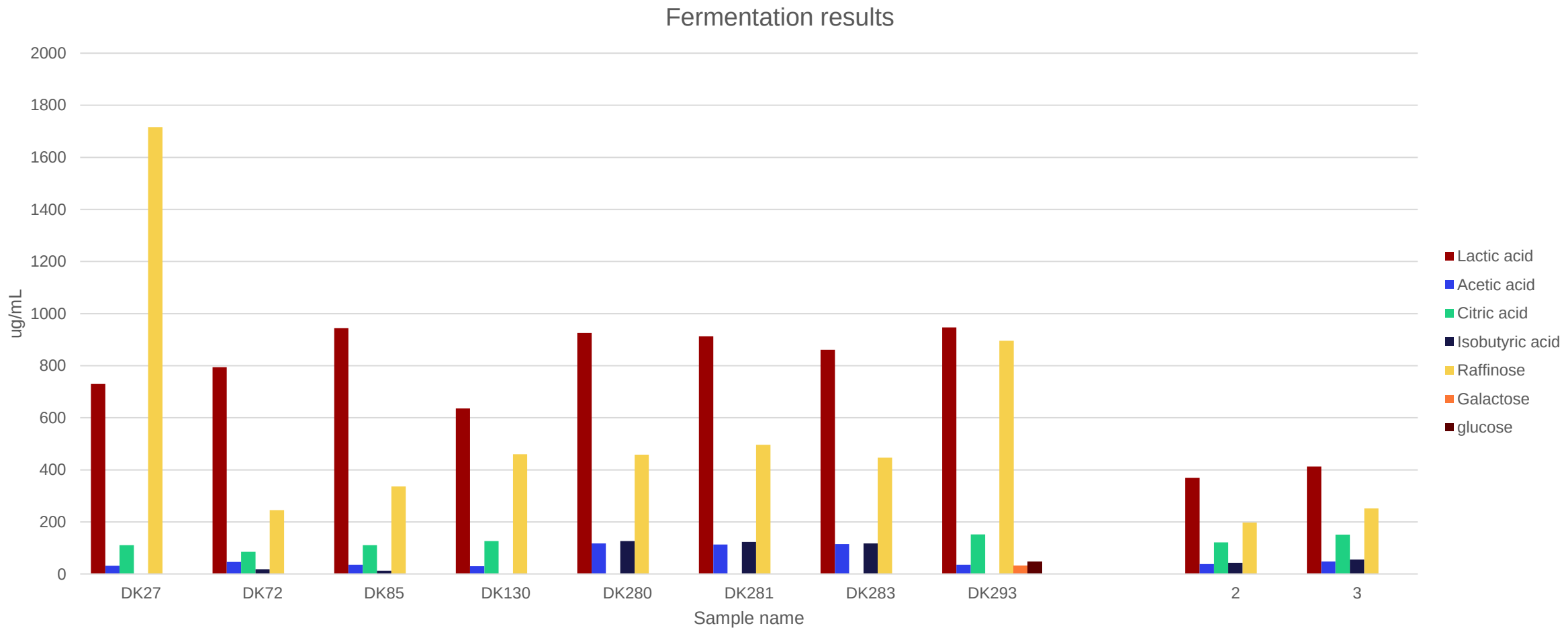
Fermentation with different percentages of BSG

Test of growth on 10%, 25%, 50%, and 100% BSG agar plates

50% BSG before shaking

50% BSG (left) and 25% BSG (right) after shaking.

Large screening of fermentation products



Acknowledgement

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