

Maximising Productivity with Natural Biosolutions



Content

Novonesis – who are we?

What are consumers looking for in yogurt?

Yogurt producers are under pressure from many sides – what can you do?

New combined cultures for yogurt production

Testimonial of a successful relationship from around the world

Now an even better toolkit, from the partnership and people you can trust

Chr. Hansen
150 years of
microbial
expertise

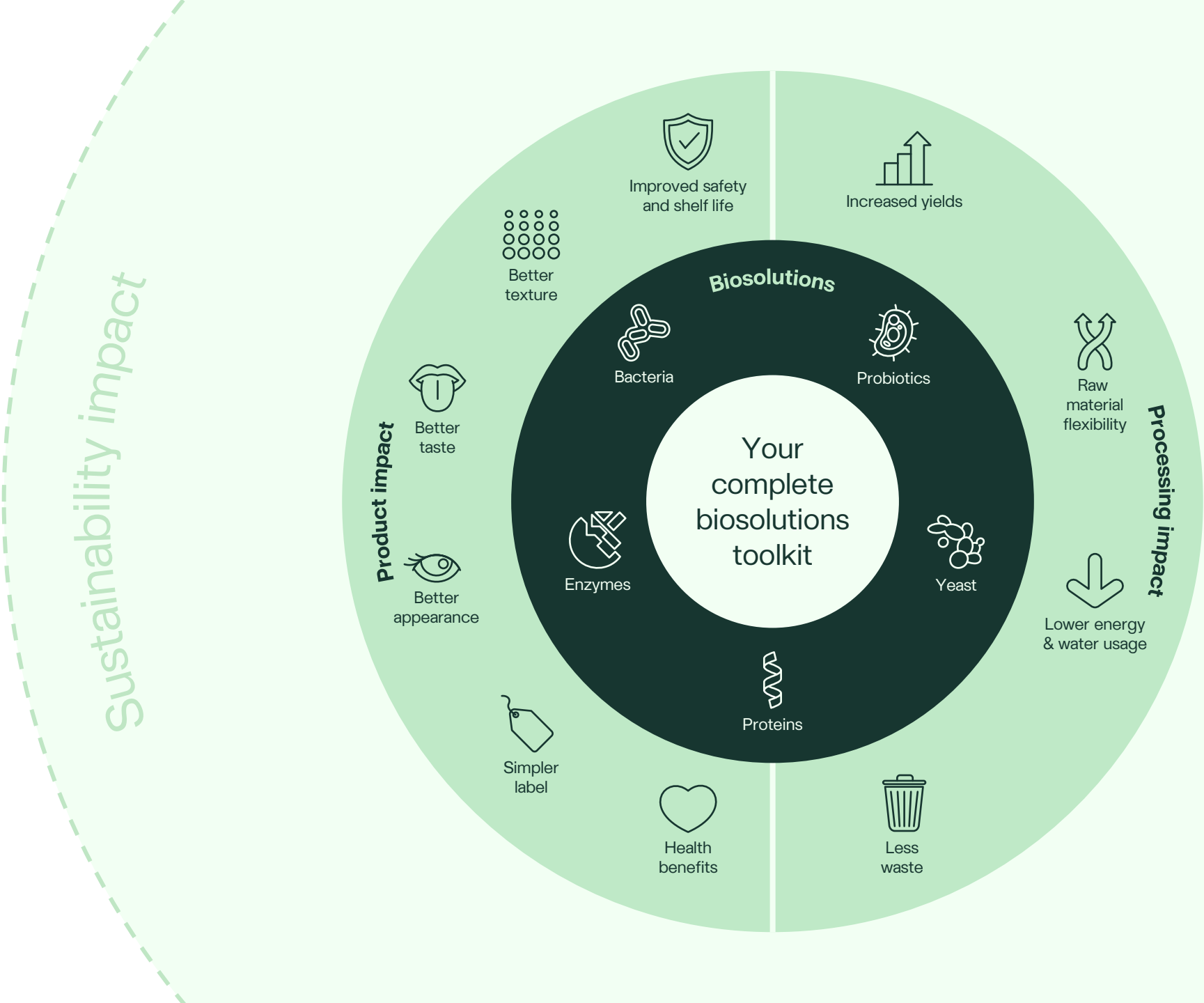
Novonesis
Leading portfolio of
Food & Beverage
Biosolutions

Novozymes
80 years of
enzymatic
expertise

Purely dedicated to biology

Biosolutions are tiny
but mighty enzymes
and microbes.

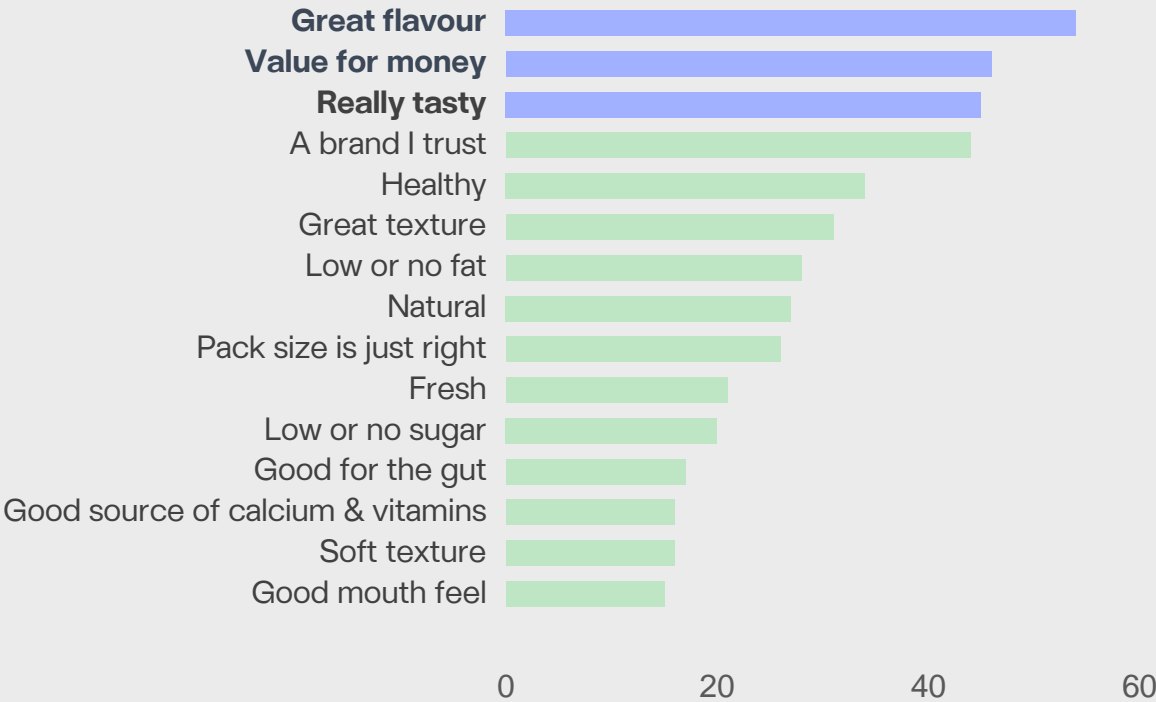
The right combination
helps transform your
products, your
processes and your
impact on the planet.



Value for money and sensory experience are the most important motivators for purchasing yogurt

REASONS FOR CHOICE – RANKED BY IMPORTANCE¹

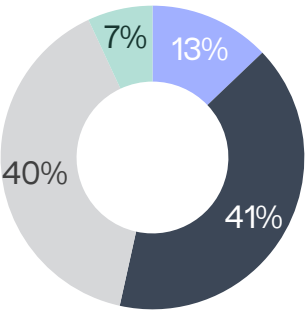
% of UK consumers



In Scandinavia, **flavor** and **price** are also the most important purchase motivators

54%

of US consumers are willing to pay more for **creamy** and **thick texture**³

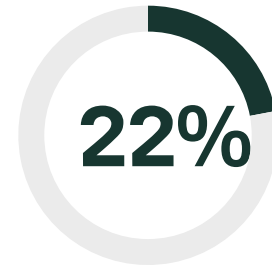


- Willing to pay MUCH more
- Willing to pay SLIGHTLY more
- NOT willing to pay more
- Not interested in purchasing

1 Chr. Hansen consumer insights on yogurt and fermented milk, UK 2020 - What are all your reasons for choosing - Select all that apply.
2 Chr. Hansen consumer insights on yogurt and fermented milk, Denmark, Sweden, Norway and Finland 2021
3 Chr. Hansen consumer insights on yogurt and fermented milk, United States 2021: percent among consumer who buy yogurt and check food labels



“Natural” is a crucial theme for yogurt buyers



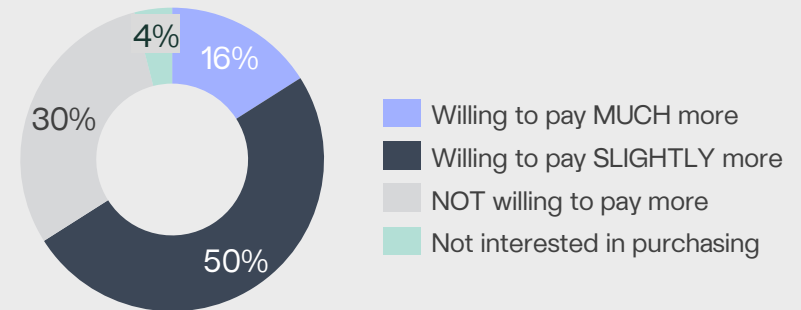
of recent spoonable yogurt launches claimed to contain no artificial additives¹

MOST IMPORTANT CLAIMS WHEN BUYING FOOD AND DRINK PRODUCTS²

- 1 No artificial ingredients
- 2 No preservatives
- 3 Locally produced/sourced
- 4 All natural

66%

of US consumers are even willing to pay more for **yogurt made with all-natural ingredients**³



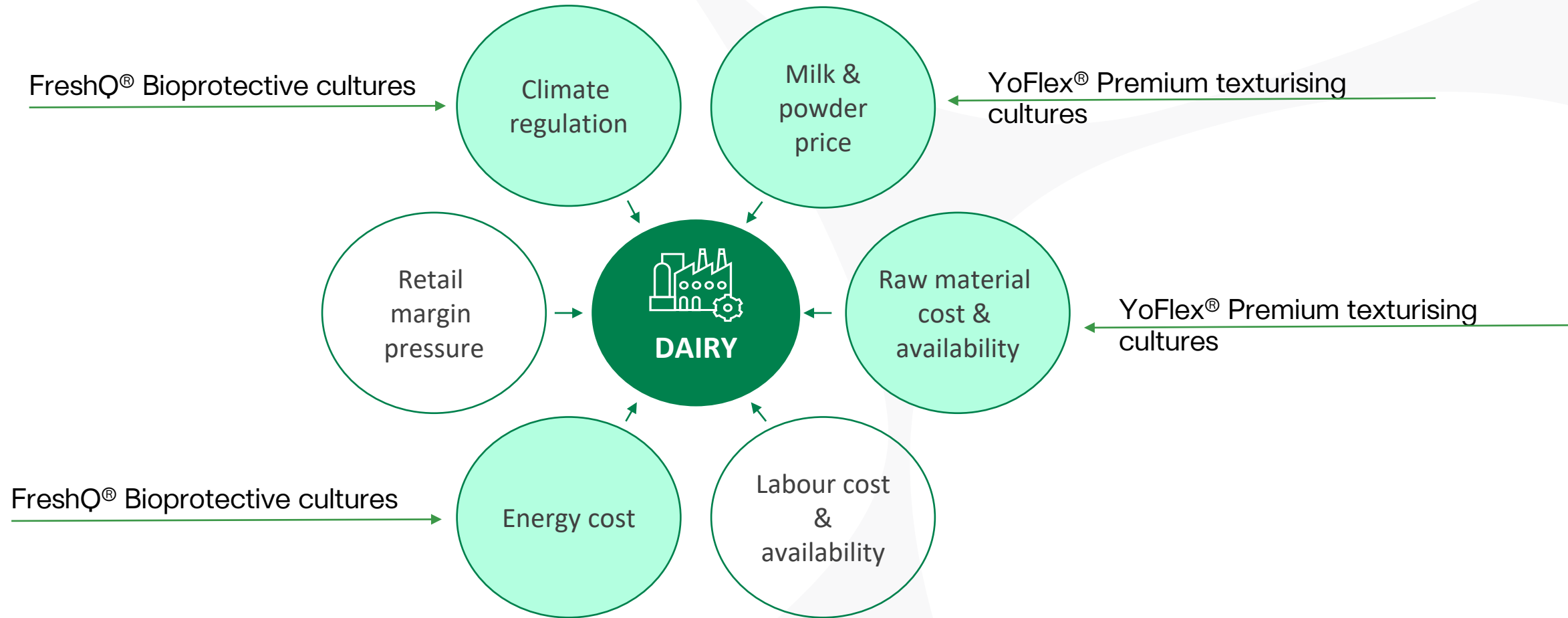
¹ Mintel 2022, Claims: Free from Added/Artificial Flavourings; All Natural Product; No Additives/Preservatives; Free from Added/Artificial Additives; Free from Added/Artificial Preservatives

² L.E.K. survey of 1600 consumers, 2020

³ Chr. Hansen consumer insights on yogurt and fermented milk, United States 2021: percent among consumer who buy yogurt and check food labels

Dairies are under pressure from multiple factors and often seek even higher productivity to remain competitive

TYPICAL DAIRY COST PRESSURES



Our comprehensive understanding of the full texture equation helps us collaborate with you to find the perfect solution

YOGURT TEXTURE DEPENDS ON THREE IMPORTANT FACTORS



Starter culture

- Resilient acidification
- Exocellular polysaccharides



Milk composition

- Milk protein
- Additives



Manufacturing process

- Temperature
- Shear

Our century of expertise within starter cultures provides the foundation for our work to help our customers create superior yogurt products.

However, the perfect texture can only be achieved by understanding the effects of milk composition and production parameters as well.

YoFlex® Premium 11 is the most recent culture in our YoFlex® Premium range with the highest texture development and robust post-acidification control



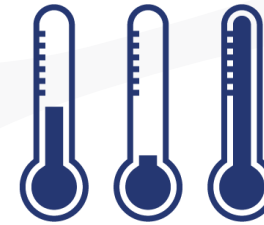
IMPROVED TEXTURE

Premium 11 provides increased mouth thickness and gel firmness compared to all other YoFlex® cultures.



MILD FLAVOR PROFILE

Premium 11 delivers our mildest flavour profile yet – opening the door to sugar reduction and longer shelf-life.

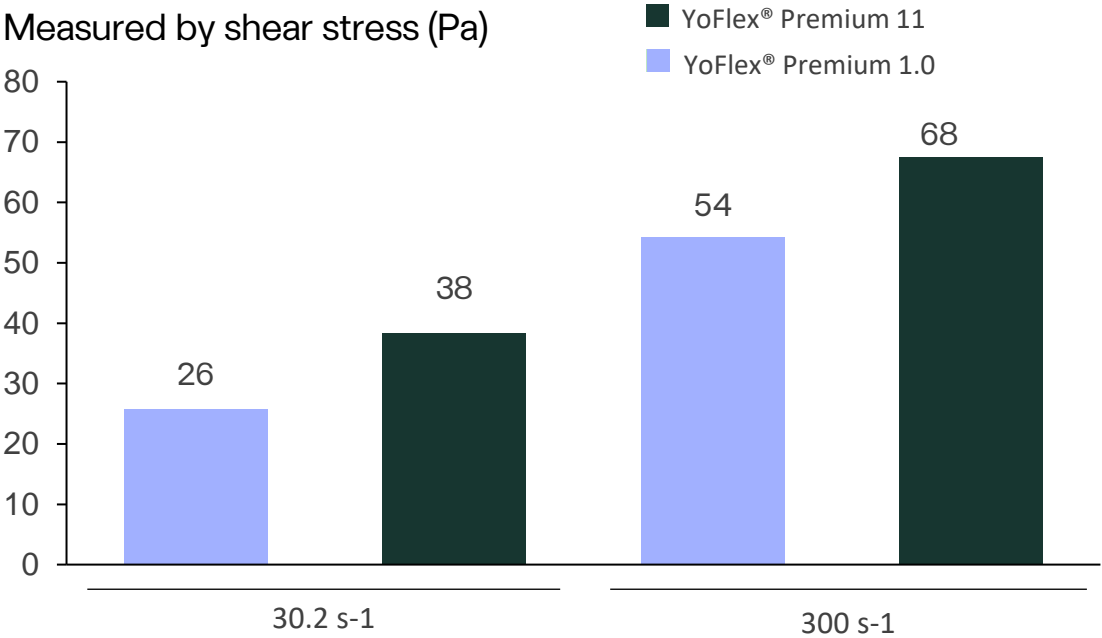


REDUCED POST ACIDIFICATION

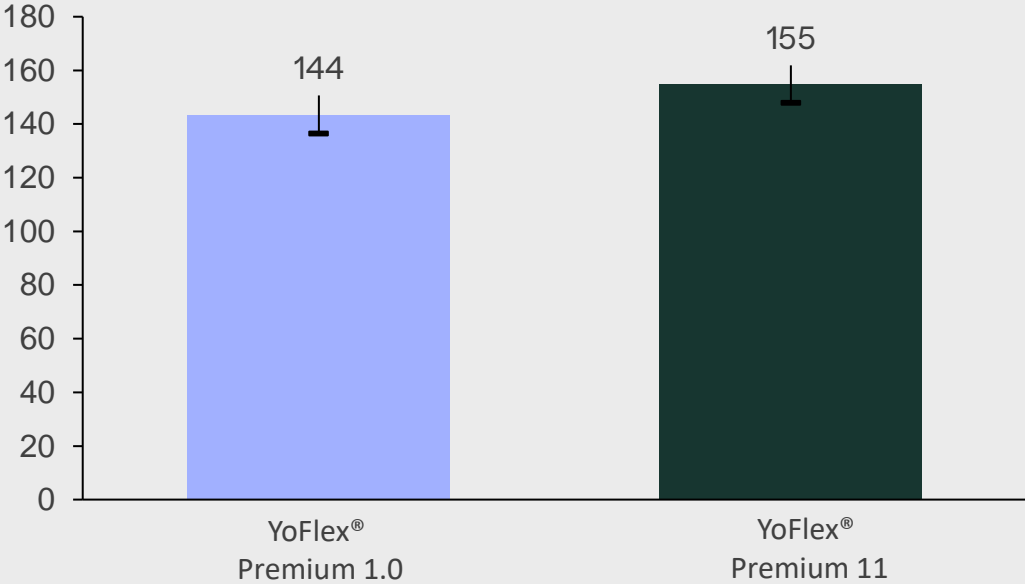
Premium 11 offers very low post-acidification, even at elevated temperatures - enabling increased filling temperatures.

YoFlex® Premium 11 provides increased texture and gives the premium experience that consumers are looking for

MOUTH THICKNESS
Measured by shear stress (Pa)

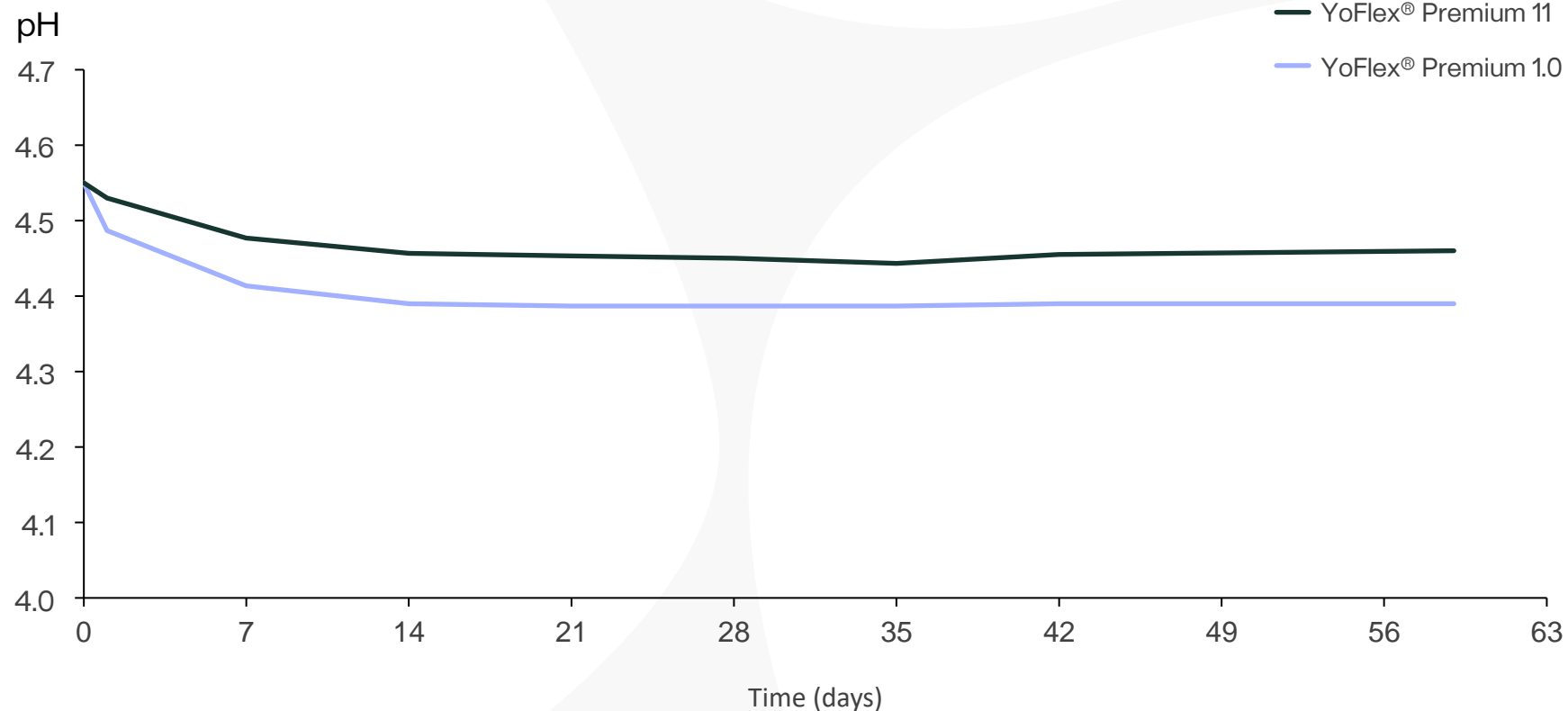


GEL FIRMNESS
Measured by complex modulus (Pa)



YoFlex® Premium 11 has very low post-acidification at refrigerated temperatures vs. Premium 1.0

POST-ACIDIFICATION PROFILE AT 6°C



Plain stirred yogurt, 1.5% fat and 4.0% protein (fresh milk and skim milk powder).

novonesis



Introducing FreshQ[®] Premium

Ready-to-use one-pouch cultures for yogurt:
combining fermentation-enabled bioprotection
with YoFlex[®] Premium, our market-leading starter culture



FreshQ® Premium offers the perfect partnership of **taste and texture while keeping** yogurt fresh for longer

PREMIUM TASTE AND TEXTURE

Achieve indulgent texture and taste, combining high mouth thickness and gel firmness with a robust culture performance for a mild flavor consumers love

FERMENTATION-ENABLED BIOPROTECTION

Use good bacteria that help protect yogurt against spoilage caused by yeast and mold when used in fermentation – keep yogurt fresh for longer

INCREASE PRODUCTIVITY

Lower recipe cost and enhance profitability with natural cultures that reduce the need for expensive skim milk powder and keep product waste low

Novonesis is dedicated to being the perfect partner for supporting your business as you innovate for the future.

FreshQ® Premium 11 represents our mission to help you remain competitive and relevant to consumers, so you can meet their needs tomorrow and beyond.

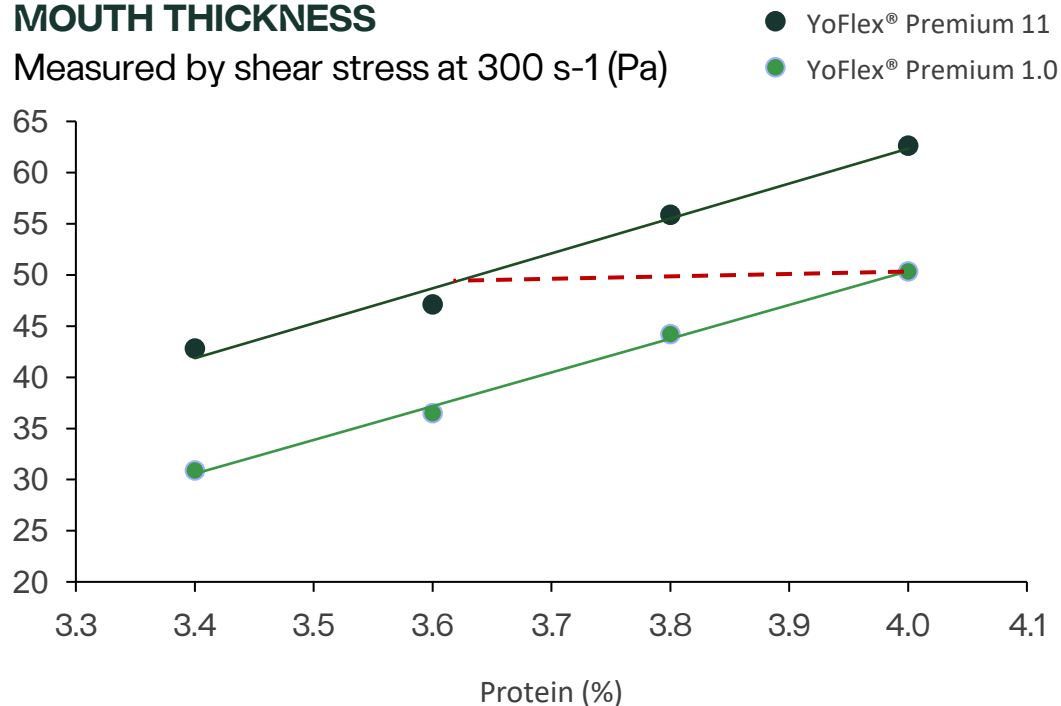
YoFlex® Premium 11 reduces the need for expensive skim milk powder in the yogurt recipe.

The all-in-one culture FreshQ® Premium 11 has the same benefit

The level of possible protein reduction depends on both the protein starting level and goals for texture outcomes

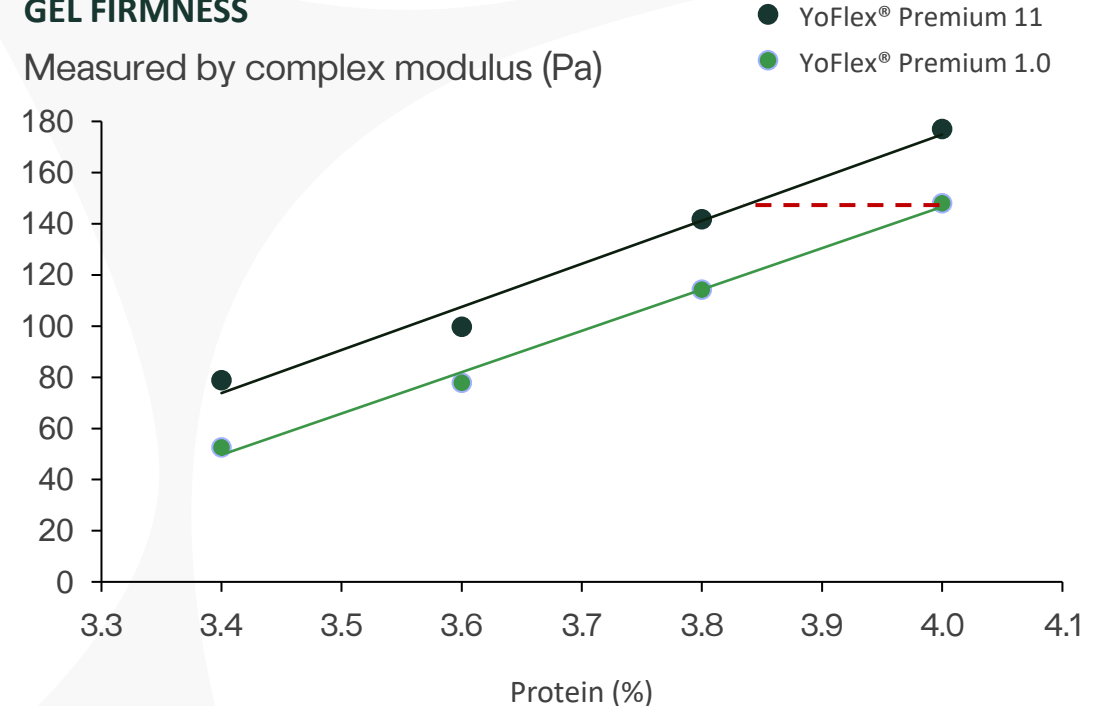
MOUTH THICKNESS

Measured by shear stress at 300 s⁻¹ (Pa)



GEL FIRMNESS

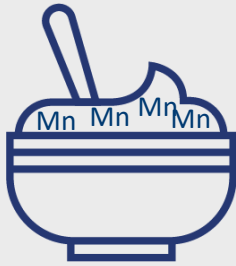
Measured by complex modulus (Pa)



Shear stress measured at 13 °C day +7 at shear rate 300 s⁻¹, with sample storage at 6°C.

Complex modulus extracted from oscillation measurements at 1.52 s⁻¹ measured at 13°C, day +7, with samples stored at 6°C.
Plain stirred yogurt: 1.5% fat and 3.4 - 4.0% protein (fresh milk and skim milk powder). Fermentation at 43°C, cut pH 4.55.

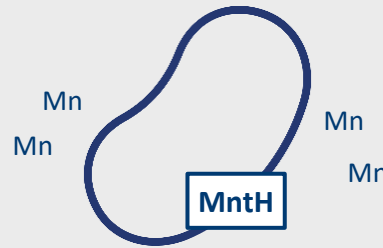
Chr. Hansen was the first to discover that the competition for manganese is a primary bioprotective mechanism that is mediated by a specific transporter (MntH)



AN ESSENTIAL NUTRIENT

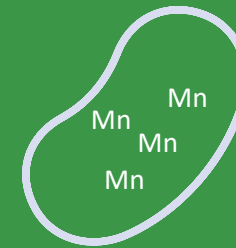
Manganese is an essential nutrient required by bacteria, yeast and mold to grow.

Manganese is available in fermented dairy products, such as yogurt, in very limited quantities.^{1,2}



A SPECIFIC TRANSPORTER

Certain lactic acid bacteria strains can absorb manganese through a transporter (MntH).



FREE MANGANESE SCAVENGER

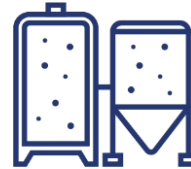
Free manganese is taken up by the lactic acid bacteria within FreshQ, further reducing the availability of this essential nutrient to yeasts and molds which inhibits their growth.

For FreshQ® cultures to perform optimally, the following conditions must be met



THE INITIAL LEVEL OF MANGANESE IN THE PRODUCT IS LOW

Milk (cow, goat and sheep) contains sufficiently low levels of manganese to be effectively depleted by the FreshQ® culture



FRESHQ® TAKES PART IN THE FERMENTATION WITH A STARTER CULTURE

Fermentation with a starter culture activates the MntH transporter of the FreshQ® culture

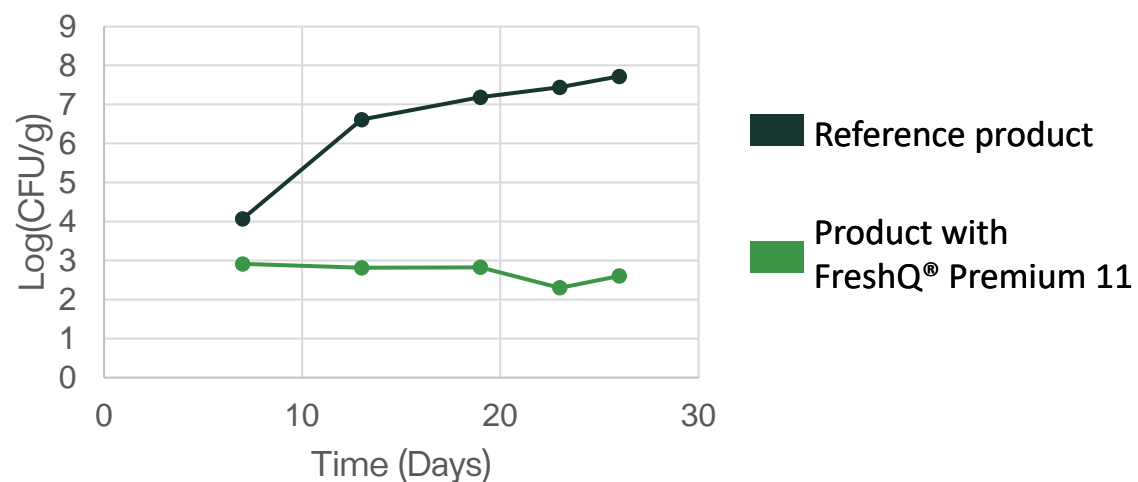


FRESHQ® STAYS ALIVE IN THE FINAL PRODUCT

Activity of live FreshQ® cells will be needed to continuously take up manganese and protect the product

FreshQ® Premium 11 demonstrates impressive growth delaying effect against yeast and molds

EXAMPLE: GROWTH OF *D. HANSENI* YEAST



Yogurt fermented with a starter culture alone or with **FreshQ® Premium 11**, added *D. hansenii* (50 cfu/mL) and stored at 7°C for 26 days.

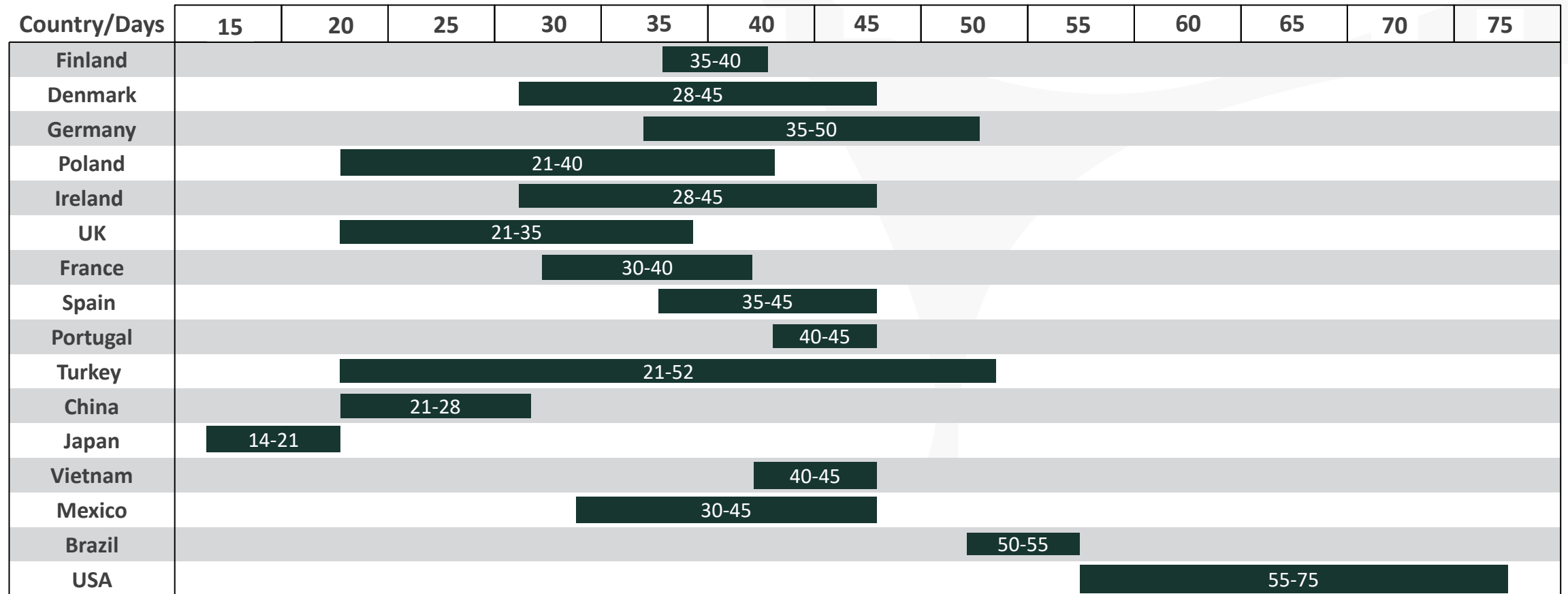
EXAMPLE: GROWTH OF THREE MOLD SPECIES



Yogurt fermented with a starter culture alone or with **FreshQ® Premium 11**, solidified by agar and spiked with *P. brevicompactum*, *P. crustosum* and *P. solitum* (500 spores/spot) before storage at 7°C for 36 days

A look at typical yogurt shelf life across markets underscores there is no “normal” shelf life

Including FreshQ® in fermentation can help extend shelf life





**Recent examples of how we partnered with
fresh dairy producers to increase their margins**



Dutch dairy wins market share and achieves higher margin with YoFlex® Premium 11 compared to competitor culture

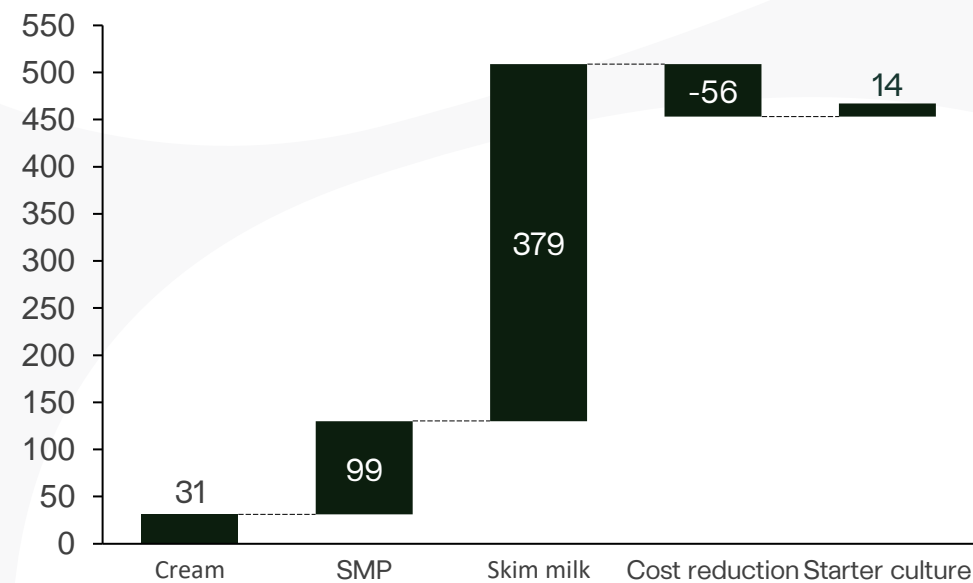
AMBITION

The customer wanted to improve the texture and overall consumer preference of their stirred yogurt to match the market leader. In addition, they wanted to do this with as little milk protein as possible.

RESULT

According to the customer, YoFlex® Premium 11 culture gave higher texture and overall consumer preference tested by an independent institute. The result was equal to the market leader but obtain with only 4 % milk protein instead 5%. This corresponds to a cost reduction of **€56** per ton yogurt with a **potential cost saving of 2.8 m€¹**. This allowed the dairy to win market share with a reduced cost giving higher margins on their yogurt line.

Euro per ton



1. €56 per ton in a 50.000-ton per year yogurt plant .

FreshQ[®] helped a European dairy get in control of their spoilage quality



THE CASE

A dairy producing premium **yogurt without artificial preservatives** was facing a dramatic increase in **consumer complaints on yeast and mold** and experiencing high levels of returns from retailers.



SUCCESS CRITERIA

A minimum of **50% reduction of batches with consumer complaints** related to yeast and molds.



RELEVANT MEASURES

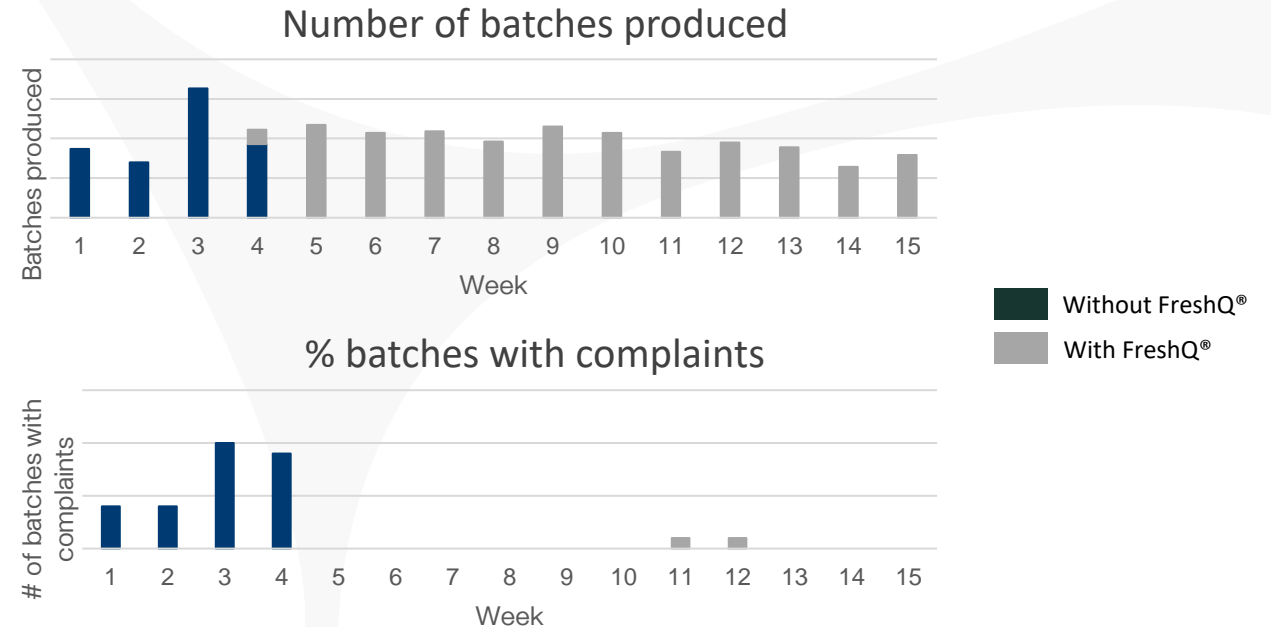
Consumer complaints and internal shelf life analysis were registered during the field trial period for all batches.



TIMELINE

Data collected for all batches (with and without the addition of FreshQ[®]) produced for a period of **15 weeks**.

NUMBER OF BATCHES PRODUCES COMPARED TO NUMBER OF BATCHES WITH CONSUMER COMPLAINTS



CONCLUSION: Consumer complaints were **significantly reduced** in batches produced with FreshQ[®], **increasing brand loyalty** from both consumers and retailers

Example of how FreshQ® helped extend shelf life and keep product fresh during open shelf life

THE CASE



A dairy producer was interested in extension of shelf life of skyr from 33 to 45 days. Product is sold in large containers and shelf life is challenged by contamination and spoilage in open shelf life.

SUCCESS CRITERIA



Extension of shelf life from 33 to 45 days with focus on keeping a fresh flavor throughout the full and extended shelf life and avoiding visual growth of yeast and molds.

RELEVANT MEASURES



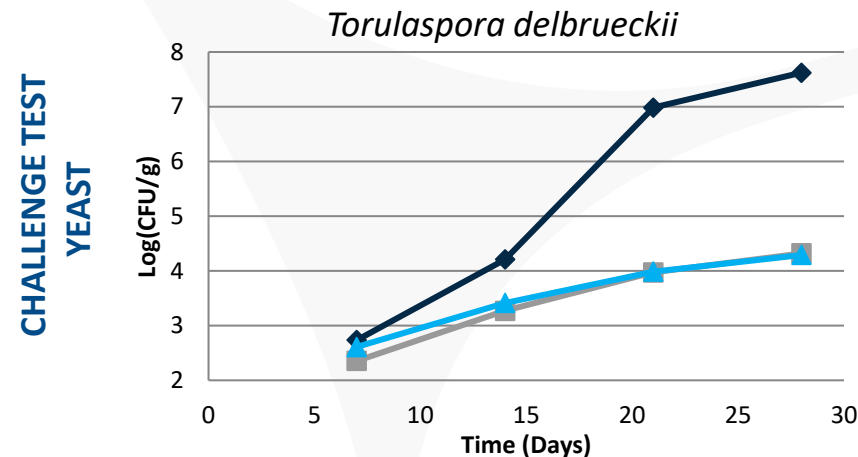
Batches with FreshQ® were followed over current and extended shelf life with evaluation of yeast and mold growth as well as weekly sensory evaluations. In addition a challenge test performed.

CONCLUSION



The dairy started using FreshQ® 12 and extended shelf life.

PRODUCT FAILURE RATES MEASURED ON ALL BATCHES PRODUCED FOR A PERIOD OF THREE MONTH



“A more mild and creamy flavor with FreshQ® 11 and FreshQ® 12 compared to reference with slightly more creamy flavor with FreshQ® 12”

CHALLENGE TEST MOLD





Thank you