

A glass pitcher and a glass filled with a pinkish-white yogurt drink, ice cubes, and fresh strawberries are placed on a picnic blanket in a grassy field. The pitcher has a curved handle and is partially filled with the drink. The glass has a red and white striped straw. The background is a soft-focus green field.

**Preserve your fresh dairy
products with BIOPROX®
range**

**A natural solution to better
respect the environnement**

What is BIOPROTECTION :

- A natural solution from nature

Why using BIOPROTECTIVE cultures ?

- Obstacle logic
- Market trends
- Scientific datas related to bioprotective culture efficiency in fermented dairy products

BIOPROX range proofs of efficiency

- BIOPROX competences in BIOPROTECTION
- Performances of the different cultures from the range



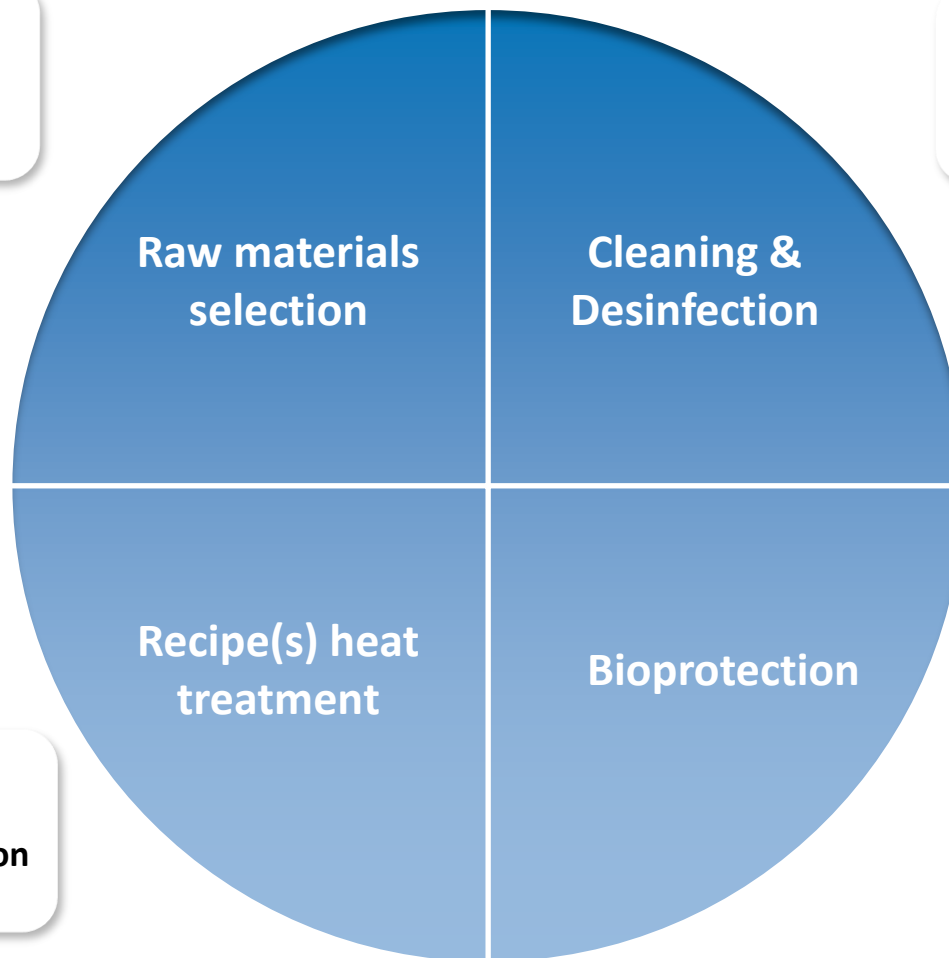
Why using **BIOPROTECTIVE** cultures ?

Logique d'obstacles

Obstacle strategy complémentaires between each others

**Raw materials selection
based on bacteriological
criterias**

**Material, Equipments,
Environment...**



**Adapted to 'clean' the
recipe before fermentation**

Market trends

Several market trends are leading the need toward natural and efficient bioprotective solutions in fermented milk products:

Snacking development

New products for a consumption everywhere and at every time of the day



Growth of fermented dairy products consumption in **countries with sub optimal conditions of storage**



BIOPROTECTION

Sustainable Food Supply

Food waste reduction & shelf life increase of end products



Clean label
End products with simple and 100% natural ingredients list

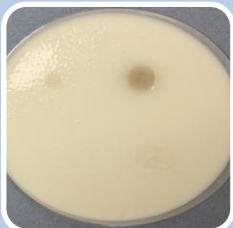




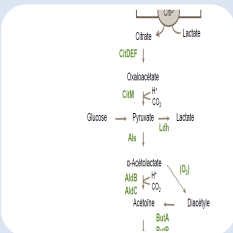
BIOPRESERVATION refer to **shelf life extension** and **food safety improvement** through the use of **natural flora** and / or its **antimicrobial compounds**.



Lactic acid bacteria have been used for centuries for the **preservation** of dairy products through the production of lactic acid: *Lactococcus*, *Lactobacillus*, *Streptococcus*, *Leuconostoc* ...



More recently, characterization of the potential and **antifungal spectrum** in the milk matrix of different **strains of Lactobacilli**: *Lb plantarum*, *Lb rhamnosus*, *Lb paracasei*, *Lb casei** but different effects depending on the matrix (yogurt, cheese).



Limited studies regarding **mechanisms involved** in biopreservation because they are complex:

Production inhibitory compounds

Competition for nutrients available in the environment

* Leyva Salas et al, 2018; Crowley et al, 2012; Lacanin et al, 2017. Li et al, 2013, Delavenne et al, 2015, Aljewicz et al, 2015 ...

1. Carboxylic acid short chain

Ex: lactic acid, acetic acid ...

2. Aromatic acids

Ex: Benzoic acid, Formic acid...

3. Composés protéiques

Lactoferrine → Lactofericine

4. Dipeptides cyclic

Bactéries Lactiques



5. Volatiles: Diacetyl, Ethanol, CO₂

6. Fatty acids

7. Reuterin

8. Lactones

9. Hydrogene peroxyde (H₂O₂)

- Quantity produced below **inhibition concentrations** (MIC) of yeasts & moulds.
- **Synergies** between molecules** ?



BIOPROX Expertise



Effective existing range

- Proven effectiveness with over 20 years of experience
- Different solutions depending on the application
- Broad spectrum of contaminant inhibition



Own collection

- Of more than 300 strains with antifungal potential
- Of yeasts and molds commonly found in the dairy industry



Technical Know How

- Specific screening on different dairy matrices
- Optimization by the combination of strains
- Characterization of the different bioprotective molecules



Scientific Partnerships

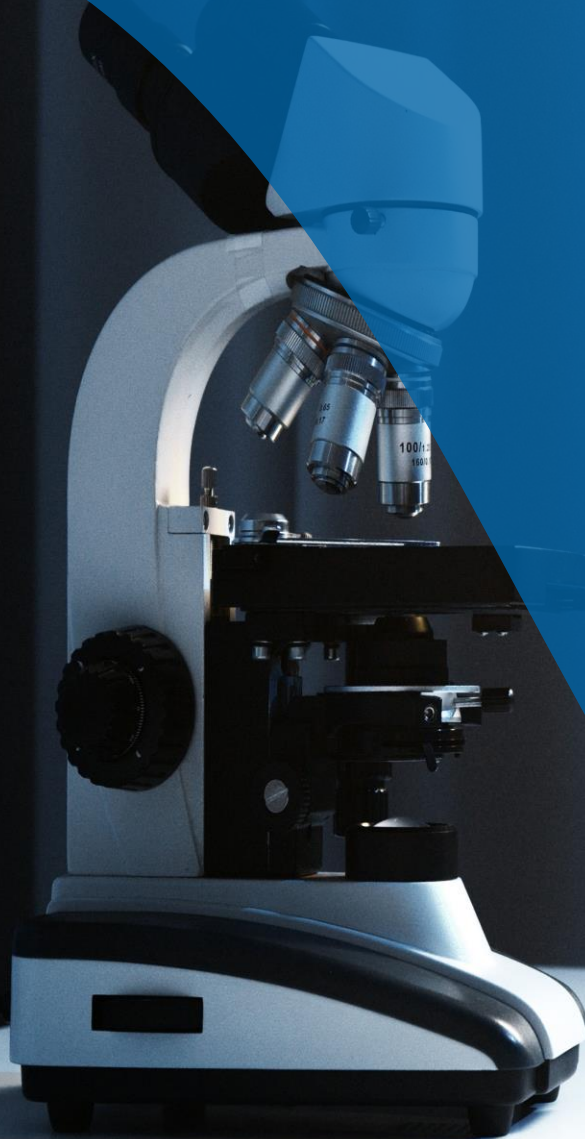
- With the french scientific network (INRA, CNRS, Pasteur Institute, etc...)
- With different dairy schools
- Customers tailor made studies



A proven and approved range

MAIN APPLICATION	FERMENTATION T°	COMMERCIAL NAME	COMPOSITION	PERFORMANCES		
				YEASTS	MOULDS	PATHOGENIC
Yoghurt, cream, fresh cheese, twarog, cottage cheese, fermented milk (leben, raïb ...)	> 30°C	<u>BIOPROX® RP80</u>	<i>Lb rhamnosus</i> <i>Lb plantarum</i>	+(+)	+++	ND
	> 30°C	<u>BIOPROX® P83</u>	<i>Lb plantarum</i>	++	+++	ND
Fresh & continental cheeses, Fermented milks	Mesophilic	<u>BIOPROX® P94</u>	<i>Lb plantarum</i>	+(+)	+++	ND
Fresh cheese, Cream cheese, Sour cream, Feta type, Fermented milk, Butter...		<u>BIOPROX® CP63</u>	<i>Lb rhamnosus</i> <i>Lb plantarum</i>	+++	+++	ND
Fermented milk, Fresh cheese, Wash rind cheeses		<u>BIOPROX® SP86</u>	<i>Lb fermentum</i>	V(+)	+++	++
Fresh and Continental cheeses: Cheddar, Manchego, Gouda, Queso fresco, ...		<u>BIOPROX® Z100</u>	<i>Lb plantarum</i>	+	+	ND

BIOPROX® RP80



Why choosing BIOPROX® RP80



BIOPROX® RP80 culture

*Blends of specific strains selected for their **Bioprotective capabilities** :*

Lb plantarum

Lb rhamnosus

Inhibition Proofs



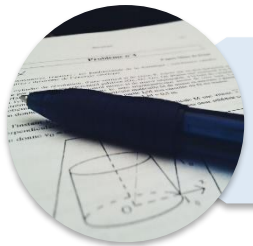
- On synthetic media, on a large selection of **yeasts and moulds**
- On fermented milk applications, **fresh cheeses & yoghurts**, on specific yeasts and moulds isolated from dairy factories
- **More than 10 years of successful use by our customers in countries with non optimal storage conditions** (Chine, Russie, Afrique du Nord)

Understanding of inhibition mechanisms



- Demonstration of the production of **specific bioprotective molecules** during a pH D
- Thermoresistant molecules

Neutral sensory profile



- No influence of this culture on the acidifying, post acidifying and sensory profile of the finished products
- Economic interest

Why choosing BIOPROX® RP80



Inhibition profile on a wide range of yeasts & moulds

	Yeasts					Moulds				
BIOPROX®	<i>Debaryomyces hansenii</i>	<i>Kluyveromyces lactis</i>	<i>Yarrowia lipolytica</i>	<i>Candida kefyr</i>	<i>Pichia spp.</i>	<i>Mucor hyemalis</i>	<i>Aspergillus niger</i>	<i>Penicillum roquefortii</i>	<i>Penicillum chrysogenum</i>	<i>Alternaria</i>
RP80	++	++	+	-	++	++	+++	+	++	+++
P83	++	++	+	+	++	+++	+	++	++	+++
P94	+++	++	+	-	+++	+++	++	++	++	+++
SP86	+++	-	-	+	+++	+++	+	++	++	+++

On synthetic media – Results interpretation:

- Contaminant growth equals vs standard without bioprotective culture = **No inhibition**
- + Contaminant growth less important vs standard without bioprotective culture – **Low inhibition**
- ++ Limited contaminant growth – **High inhibition**
- +++ No contaminant growth – **Total inhibition**

Why choosing BIOPROX® RP80



Inhibition proofs in fresh cheese application

- Protocol: Production of **fresh cheese** with acidification culture DI-PROX +- BIOPROX RP80 at 20 dosis/1000L – **Incubation at 33°C** – Stop at pH4,60 – Whey separation to reach 55% dry matter
- Test on 4 molds and yeasts on agar (fresh cheese + Agar + spot of yeast and molds)
- Incubation at **15°C for 7 days**. Control of the colony growth

Plate 1:

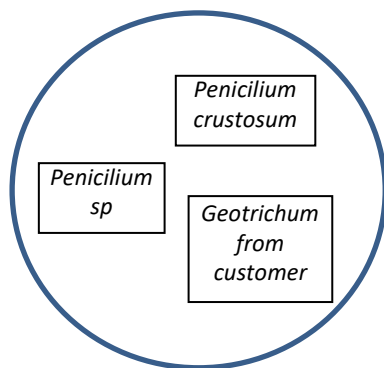
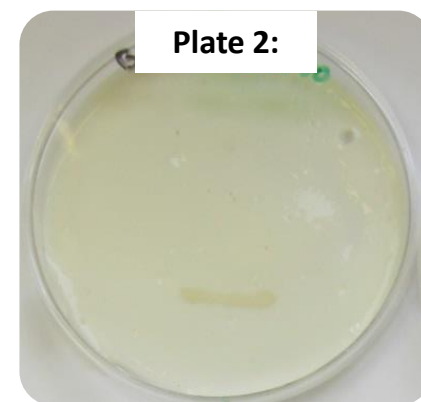
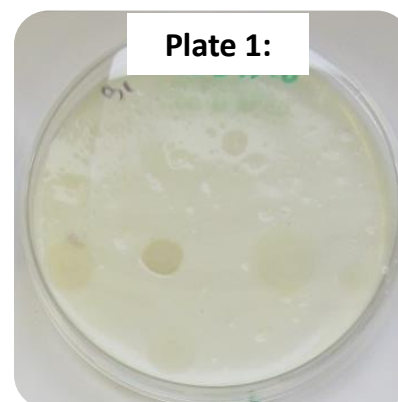
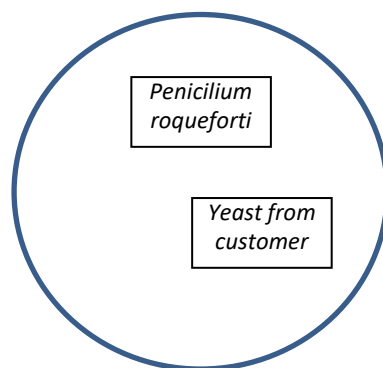


Plate 2:



Inhibition RP80 7 Days - 15°C	<i>Penicillium crustosum</i>	<i>Penicillium commune</i> Pe	<i>Geotrichum client</i>	<i>Penicillium roqueforti</i>	<i>Levure client</i>
	++	++	+	++	-

Results interpretation: - Contaminant growth similar to standard without biopreservation ; + Inhibition of contaminant growth; ++ No growth of the contaminant

Why choosing BIOPROX® RP80

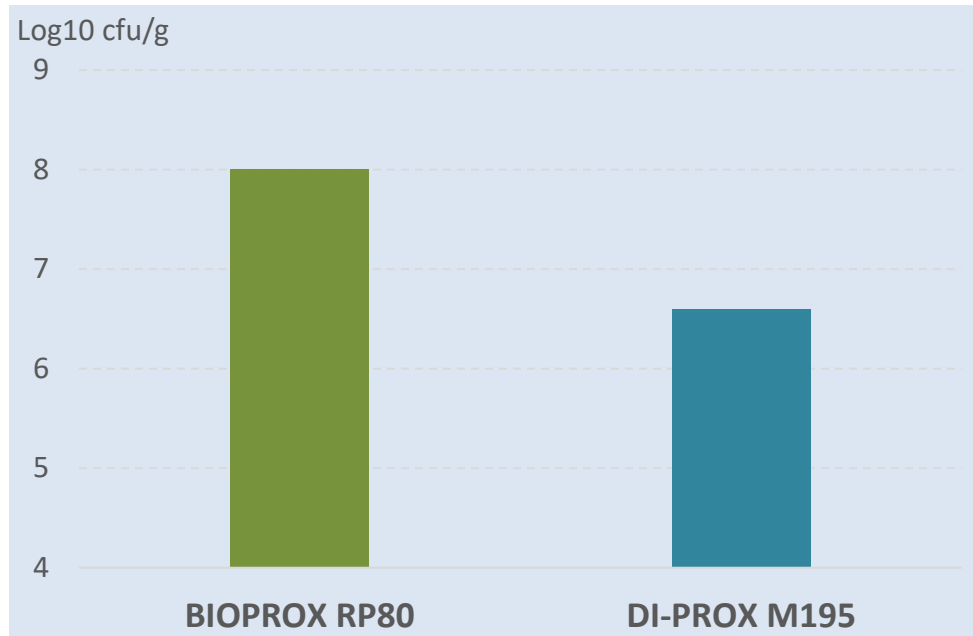


*Inhibition proof in **quark** (fresh cheese with heat treatment) application*

Protocol: Industrial quark production with DI-PROX M195 20UA/1000L + BIOPROX RP80 at 30 doses/1000L – Heat treatment 60°C for 30min



Enumeration in end product - After heat treatment (60°C – 30min)



➔ Very good survival of BIOPROX RP80 after heat treatment in QUARK / TWAROG application

Why choosing BIOPROX® RP80



Inhibition proofs in fermented milk application

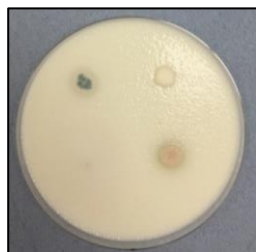
Protocol: Production of **fermented product** with DI-PROX for acidification +- BIOPROX RP80 20 dosis/1000L – Incubation at 30°C – Fermentation stop at pH4,60

Inhibition test on **molds** on fermented milk agar with molds spots.

Incubation 21 days – 7°C



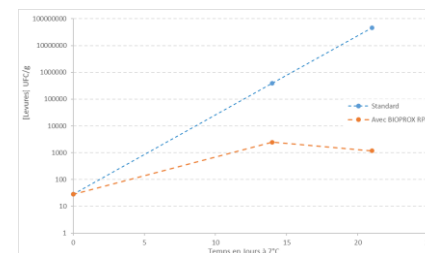
Standard



With Bioprotection

Inhibition test on **yeasts** in cups with fermented milk +- yeasts.

Incubation 21 days – 7°C - Control of yeasts population



Molds*				Yeasts**		
<i>Penicillium crustosum</i>	<i>Penicillium chrysogenum</i>	<i>Penicillium roqueforti</i>	<i>Aspergillus niger</i>	<i>Rhodotorula mucilaginosa</i>	<i>Candida intermedia</i>	<i>Candida lusitanae</i>
+	++	+	++	++	++	+

Results interpretation:

+ Some inhibition of the contaminant; ++ No growth of the contaminant

Why choosing BIOPROX® RP80

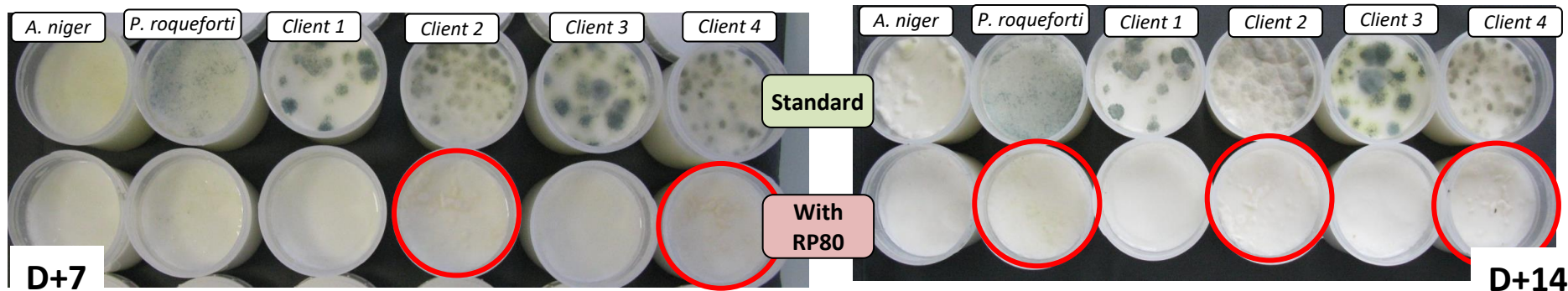


Inhibition proofs in *yoghurt* application

Protocol: Yoghurt production with BIOPROX acidifying culture +- BIOPROX RP80 20 dosls/1000L – **Incubation at 42°C** – Fermentation stop at pH4,60

Addition of 6 moulds between 20 & 80 spores / mL: *Aspergillus niger*, *Penicillium roqueforti*, 4 contaminants from customers

Incubation at **20°C during 14 days**. Analysis at D+ 7 & D+14.



With RP80 Storage at 20°C	Molds					
	<i>Aspergillus niger</i>	<i>Penicillium roqueforti</i>	<i>Penicillium customer 1</i>	<i>Penicillium customer 2</i>	<i>Mold customer 3</i>	<i>Mold customer 4</i>
D+7	++	++	++	+	++	+
D+14	++	+ No coloration	++	+ No coloration	++	+ No coloration

+ Some inhibition of the contaminant; ++ High inhibition of the contaminant

Why choosing BIOPROX® RP80



Understanding of BIOPROTECTION mechanisms

3 years PhD work with the objective of highlighting the molecules involved in the inhibitory activity of BIOPROX BIOPROTECTIVE cultures

Biopreservation of lactic matrix with selected starters

Meg ROUXEL 2016 - 2019

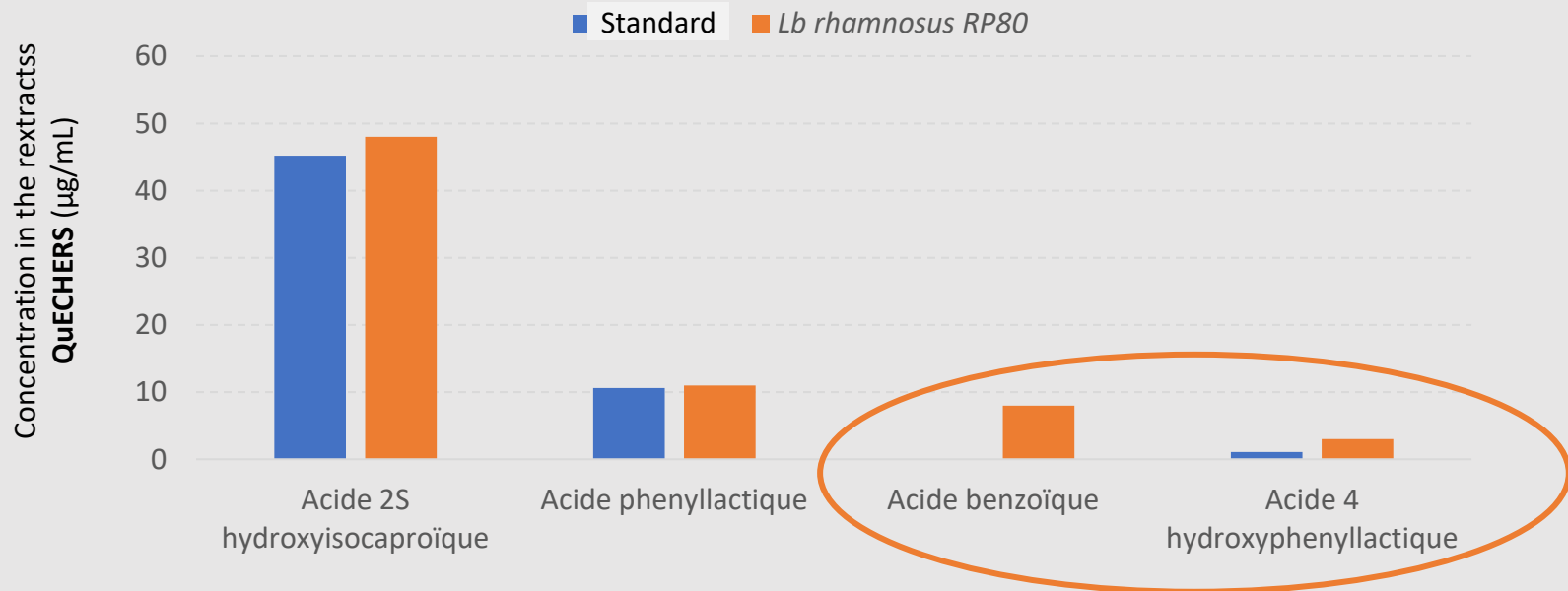
W. AUCHER, J. VERDON et JM. BERJEAUD

Scientific article published in Internal Journal of Food Microbiology, 2019



Understanding of *BIOPROTECTION* mechanisms

Determination of minor organic acids produced in milk medium Comparison of acidifying cultures vs bioprotective culture*

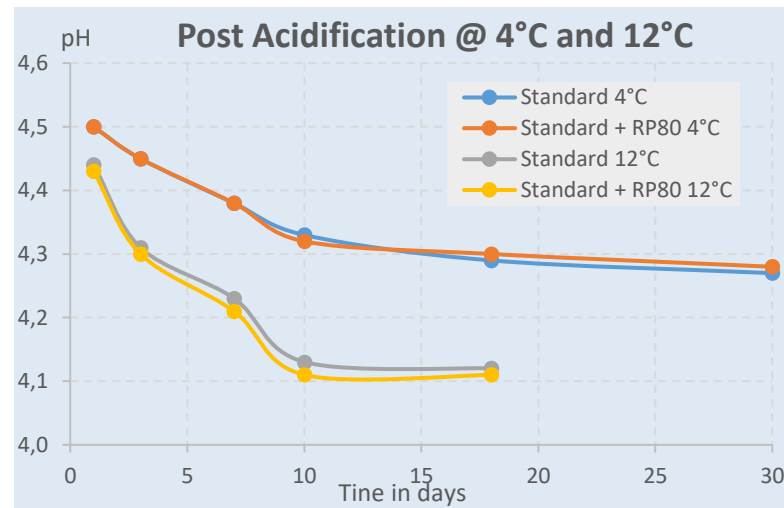
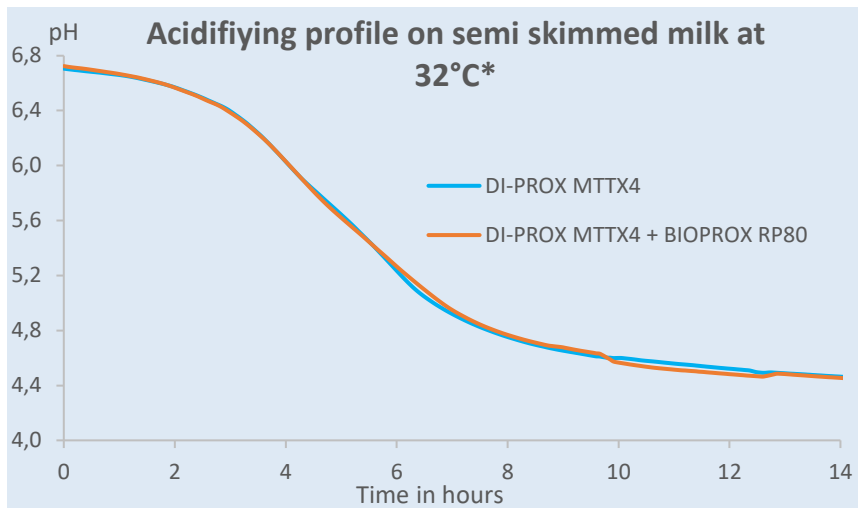


- ➔ Demonstration of the production of molecules with antifungal interest
- ➔ Production of thermoresistant molecules: Positive antifungal activity after heat treatment of the supernatant for 15min @ 120°C

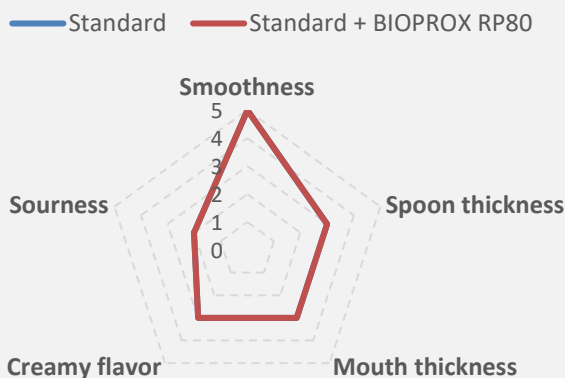
Why choosing BIOPROX® RP80



No influence on end products **sensory profile** (ex: fermented milk)



Sensory profile at D+7



Addition of BIOPROX® RP80 has no influence regarding:

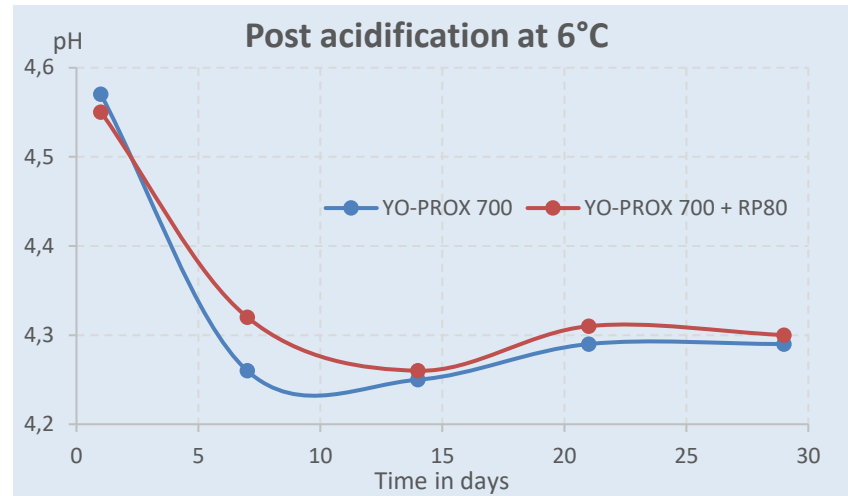
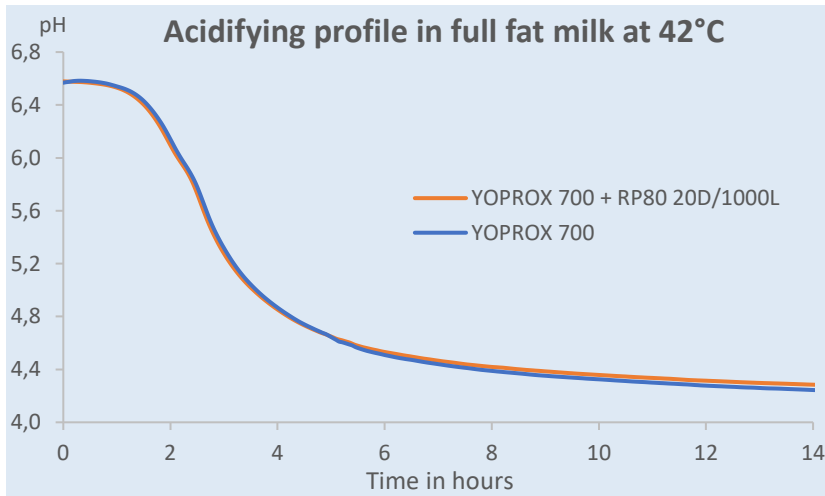
- Fermentation profile
- Post acidification profile
- Sensory profile of end products

* Inoculation at 20UA/1000L for DI-PROX MTTX4 & 20 dosis/1000L for BIOPROX RP80

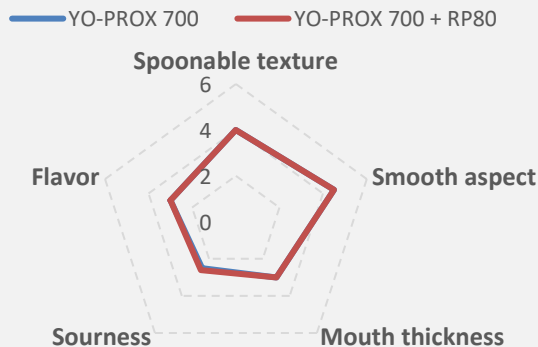
Why choosing BIOPROX® RP80



*No influence on end products **sensory profile** (ex: yoghurt)*



Sensory profile at D+7



Addition of BIOPROX® RP80 has no influence regarding:

- Fermentation profile
- Post acidification profile
- Sensory profile of end products like yoghurt

* Inoculation at 50UA/1000L for YO-PROX 700 & 20 dosis/1000L for BIOPROX RP80

HIGH INHIBITION OF THE GROWTH OF A WIDE RANGE OF YEASTS & MOLDS

BENEFITS :

- **Shelf life extension of end products:**
 - ✓ Waste reduction
 - ✓ Better inventory management
- **Reduction of customer complaints and the risk of negative exposure on social networks**
- **Possibility of eliminating sorbate and other preservatives to develop clean label recipes**



EASE OF TECHNOLOGICAL IMPLEMENTATION:

→ **BENEFITS : Easy and Quick to set up even in existing recipes**

- No influence on acidifying profile
- No influence on post acidification profile
- No influence on sensory profile



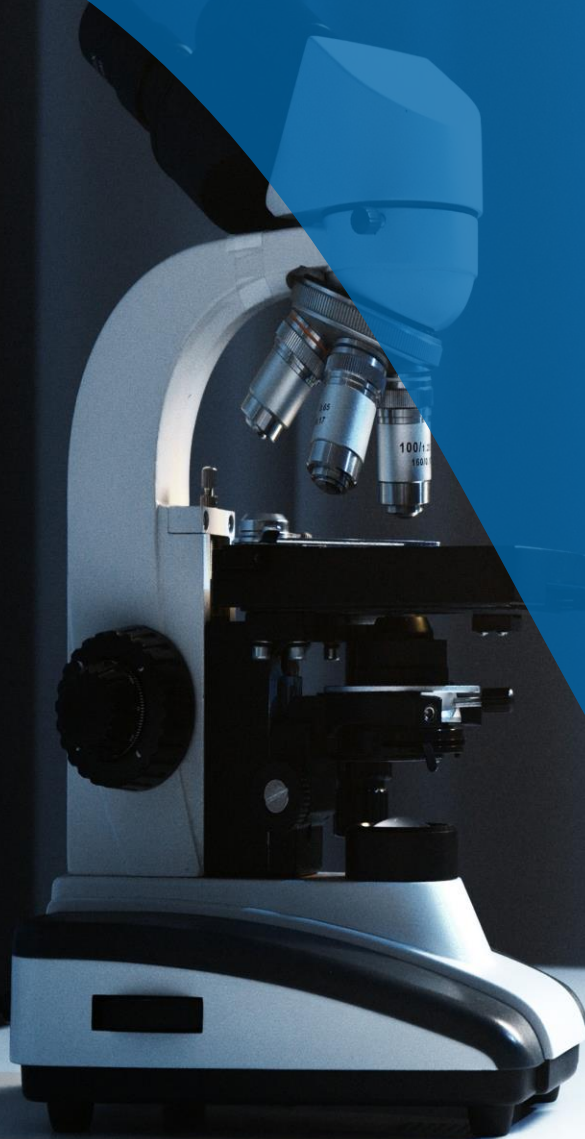
BIOPROX RP80 CAN BE USED IN MULTIPLE APPLICATION AT THE RATE OF 30D/1000L:

- Fermented milks (ex: leben, kefir type ...)
- Quark, twarog, cottage cheese
- Smetana
- Yoghurt, fermented milks

To obtain the best results with BIOPROX RP80, the fermentation temperature need to be higher than 30°C



BIOPROX® P83



Why choosing BIOPROX® P83



Lb plantarum strain selected for its bioprotective performances in products fermented at $T^{\circ} > 30^{\circ}\text{C}$

Inhibition profile on a wide range of yeasts and molds

	Yeasts					Molds				
BIOPROX®	<i>Debaryomyces hansenii</i>	<i>Kluyveromyces lactis</i>	<i>Yarrowia lipolytica</i>	<i>Candida kefyr</i>	<i>Pichia spp.</i>	<i>Mucor hyemalis</i>	<i>Aspergillus niger</i>	<i>Penicillium roquefortii</i>	<i>Penicillium chrysogenum</i>	<i>Alternaria</i>
P83	++	++	+	+	++	+++	+	++	++	+++

On synthetic media – **Results interpretation:**

- Contaminant growth equals vs standard without bioprotective culture = **No inhibition**

+ Contaminant growth less important vs standard without bioprotective culture – **Low inhibition**

++ Limited contaminant growth – **High inhibition**

+++ No contaminant growth – **Total inhibition**

Pourquoi choisir BIOPROX® P83



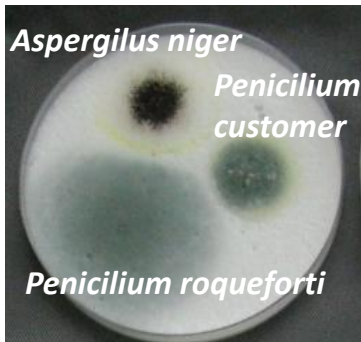
Inhibition proofs on yoghurt

Yoghurt production with YO-PROX 700 +- BIOPROX P83 20 dosis/1000L

– Incubation at 42°C – End of fermentation at pH4,60.

Inhibition test on agar plate + yoghurt + 3
different molds

Incubation 7 days at 20°C



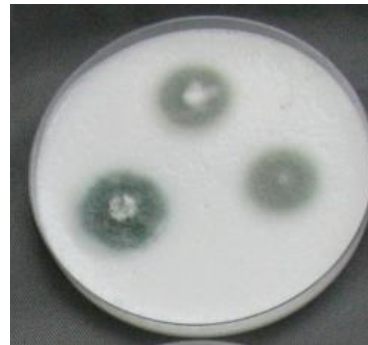
Standard WITHOUT P83



WITH BIOPROX P83

Inhibition test on agar plate + yoghurt + 3 molds isolated
from **yoghurt customer**

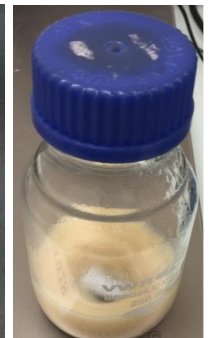
Incubation 7 days at 20°C



Standard WITHOUT P83



WITH BIOPROX P83



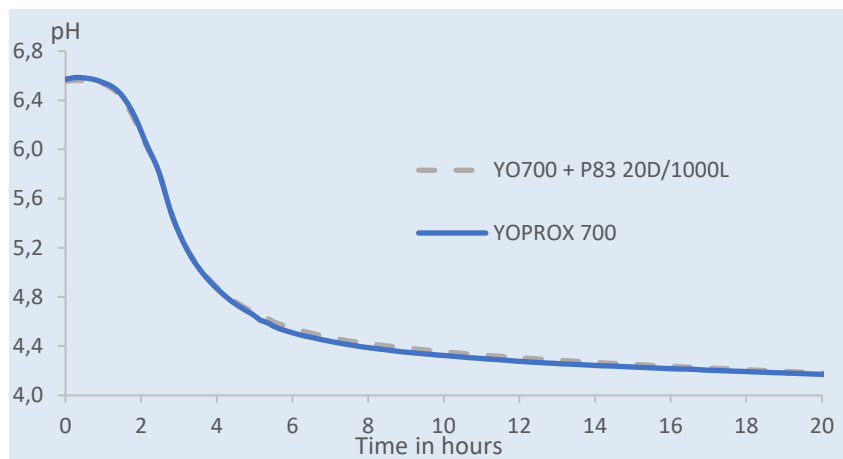
BIOPROX P83 addition inhibits the growth of different molds, allowing:

- Increase of shelf life even in difficult storage conditions
- Waste reduction
- Reduction of customer complains and negative impact on social network

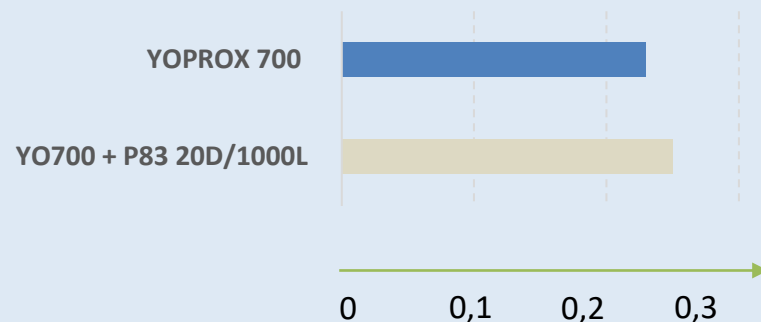
Why choosing BIOPROX® P83



No influence on end products *sensory profile*



Post acidification : Δ pH D+30 at 4°C



Fermentation with YO-PROX 700 @ 50UA/1000L

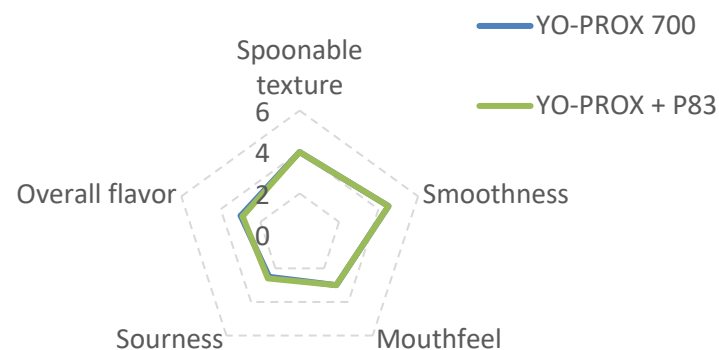
+/- BIOPROX P83 at 20UA/1000L

Incubation at 43°C on 12% reconstituted skimmed milk

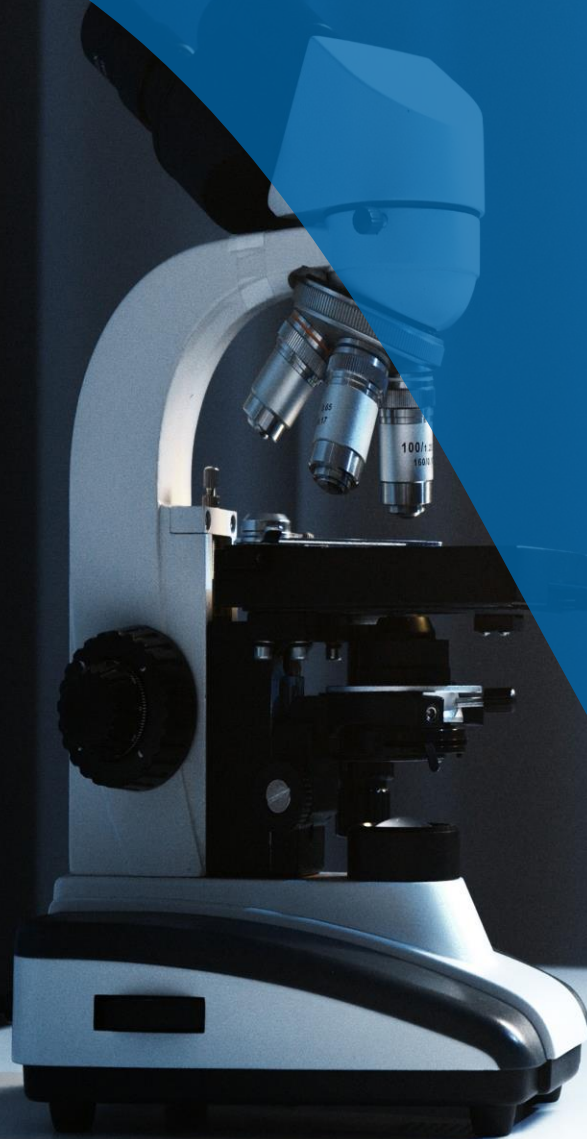
Addition of BIOPROX® P83 has no influence on:

- Fermentation profile
- Post acidification profile
- Sensory profile of end products.

Sensory profile at D+28



BIOPROX® P94



Pourquoi choisir BIOPROX® P94



Lb plantarum strain selected for its bioprotective performances in mesophilic process

Inhibition profile on a wide range of yeasts and molds

	Yeasts					Molds				
BIOPROX®	<i>Debaryomyces hansenii</i>	<i>Kluyveromyces lactis</i>	<i>Yarrowia lipolytica</i>	<i>Candida kefyr</i>	<i>Pichia spp.</i>	<i>Mucor hyemalis</i>	<i>Aspergillus niger</i>	<i>Penicillum roquefortii</i>	<i>Penicillum chrysogenum</i>	<i>Alternaria</i>
P94	+++	++	+	-	+++	+++	++	++	++	+++

On synthetic media – **Results interpretation:**

- Contaminant growth equals vs standard without bioprotective culture = **No inhibition**
- + Contaminant growth less important vs standard without bioprotective culture – **Low inhibition**
- ++ Limited contaminant growth – **High inhibition**
- +++ No contaminant growth – **Total inhibition**

*Inhibition proofs on **Fresh cheeses***

Fresh curd prepared with M270 with 10% reconstituted milk

With

Bioprotective culture at 80 D/1000L

With and without

Potassium sorbate at different concentrations



Incubation 18h at 22°C



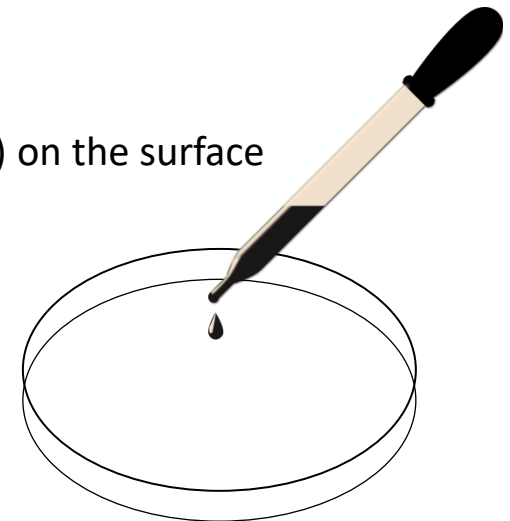
Distribution in petri dishes



Deposit of molds of different origins (10^3 at 10^4 spores) on the surface



Observation after 7 days at 25°C



Why choosing BIOPROX® P94

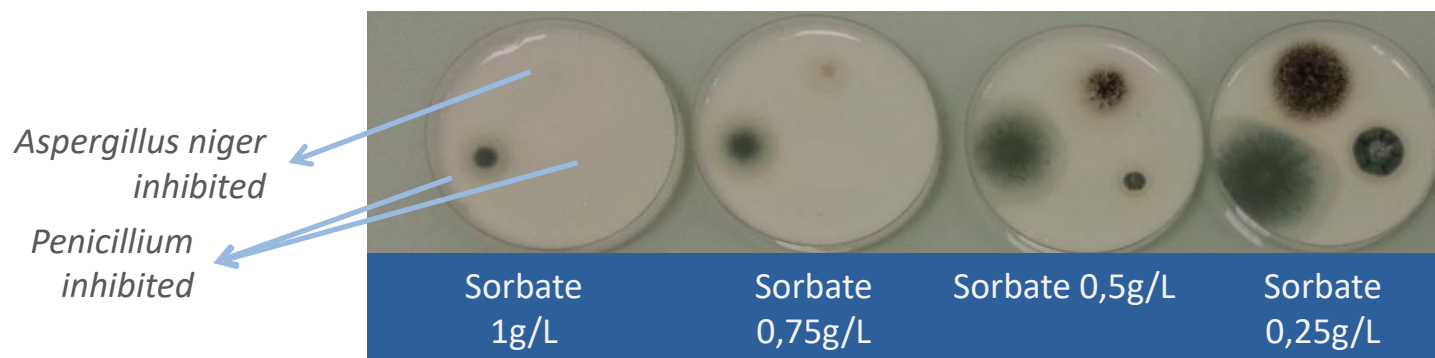
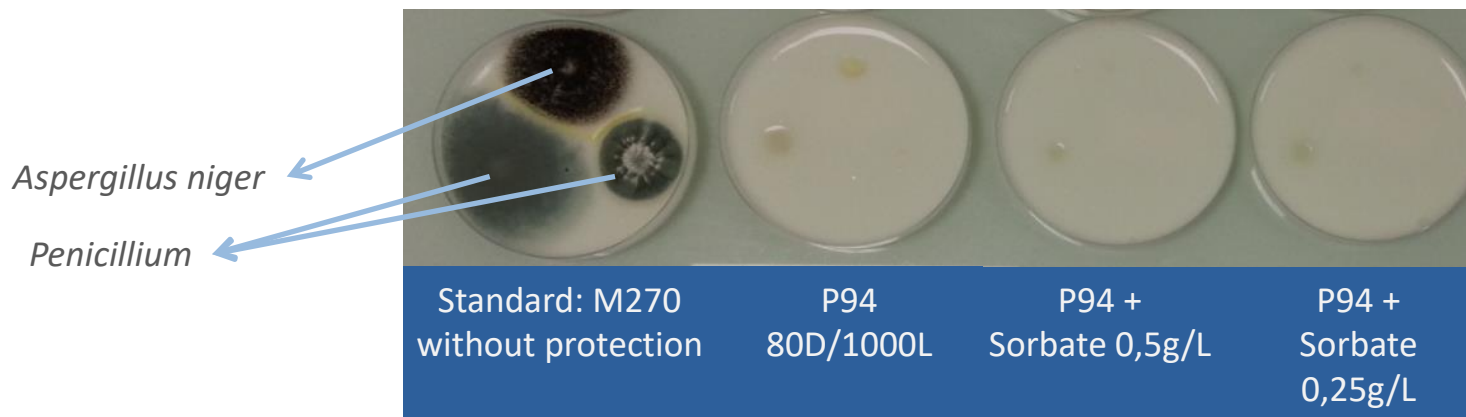


Inhibition proofs in *Fresh cheese with contaminant from Faisselle origin*

3 molds applied : *Aspergillus niger* / *Penicillium roqueforti* / *Penicillium* isolated from customer faisselle



Observation after 7 days at 25°C



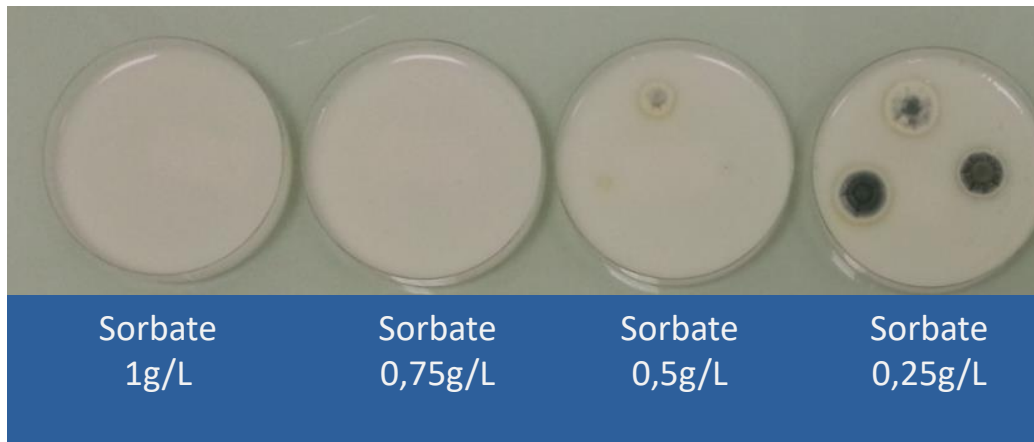
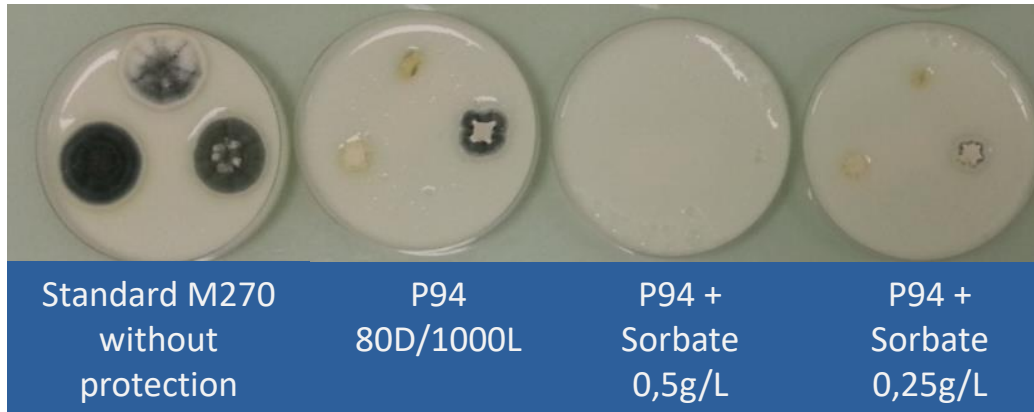
Why choosing BIOPROX® P94



*Inhibition proofs in **Fresh cheese with contaminant from Manchego origin***

3 molds applied : *Penicillium* isolated from Manchego (close to *P. rugulosum*)

Observation after 7 days at 25°C



Why choosing BIOPROX® P94



Inhibition proofs in Fresh cheese with contaminant from Manchego origin

3 molds applied: *Penicillium* isolated from Manchego

Observation after 7 days at 25°C



Standard M270
without
protection

P94
80D/1000L

P94 +
Sorbate
0,5g/L

P94 +
Sorbate
0,25g/L



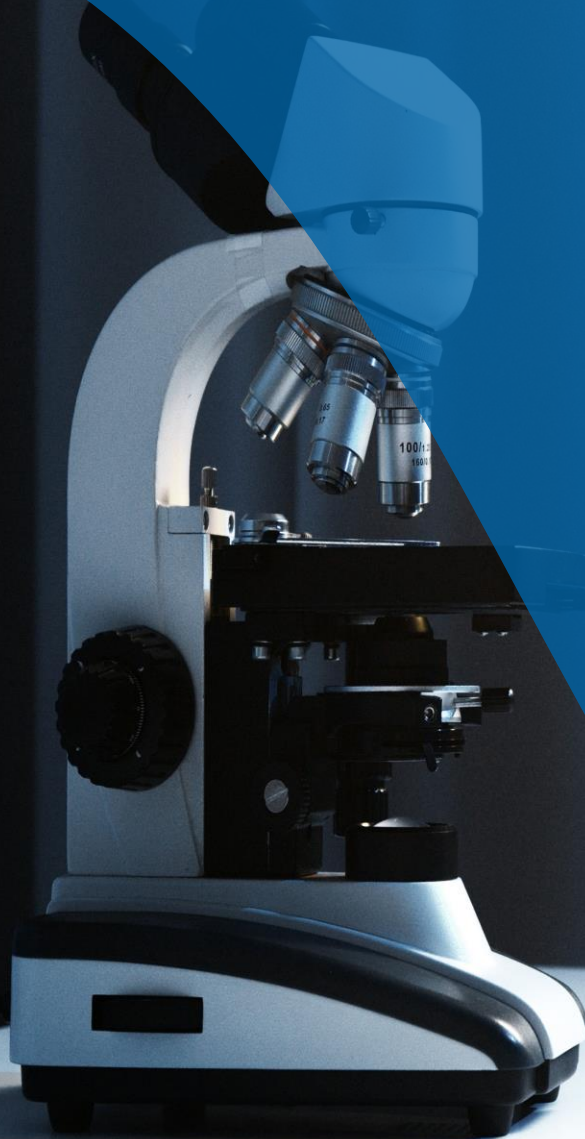
Sorbate
1g/L

Sorbate
0,75g/L

Sorbate
0,5g/L

Sorbate
0,25g/L

BIOPROX[®] CP63



Why choosing BIOPROX® CP63



BIOPROX® CP63 culture

Blend of specific strains selected for their **Biopreservation** potential:

Lb rhamnosus

Lb plantarum

Inhibition Proofs



- ***Lb rhamnosus*** strain screened among more than 130 strains of the BIOPROX collection selected for its effectiveness against **yeasts and moulds**
- **Efficiency optimization** with the *Lb rhamnosus* / *Lb plantarum* combination
- **Efficacy verified in dairy applications** on yeasts and molds found in the dairy industry

Understanding of inhibition mechanisms



- Demonstration of the production of **specific bioprotective molecules** during a pHd
- Publication in **International Journal of Food Microbiology**

Sensory benefits



- Development of **cream flavor notes** during all shelf life
- No influence on post acidification and perception of **sourness reduction**

Why choosing BIOPROX® CP63

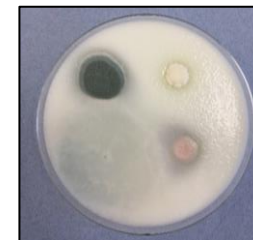
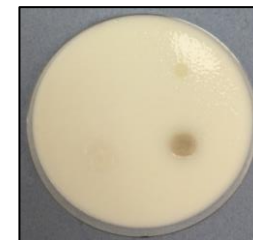


Inhibition profile on a broad spectrum of molds and yeasts

<i>Penicillium crustosum</i>	<i>Penicillium chrysogenum</i>	<i>Penicilium roqueforti</i>	<i>Aspergillus niger</i>	<i>Aureobasidium pullulans</i>
+	++	+	++	+

Growth at 30°C for 24 hours and evaluation of the **anti-mold activity** after incubation for 7 days at 25°C.

‘++’ Strong inhibition, ‘+’ Inhibition, ‘-’ No inhibition



<i>Rhodotorula mucilaginosa</i>	<i>Candida intermedia</i>	<i>Candida lusitanae</i>	<i>Torulospora delbrueckii</i>
++	++	+	+

Growth at 30°C for 24 hours and evaluation of the **anti-yeast activity** after incubation for 48 hours at room temperature.

‘++’ Strong inhibition, ‘+’ Inhibition, ‘-’ No inhibition



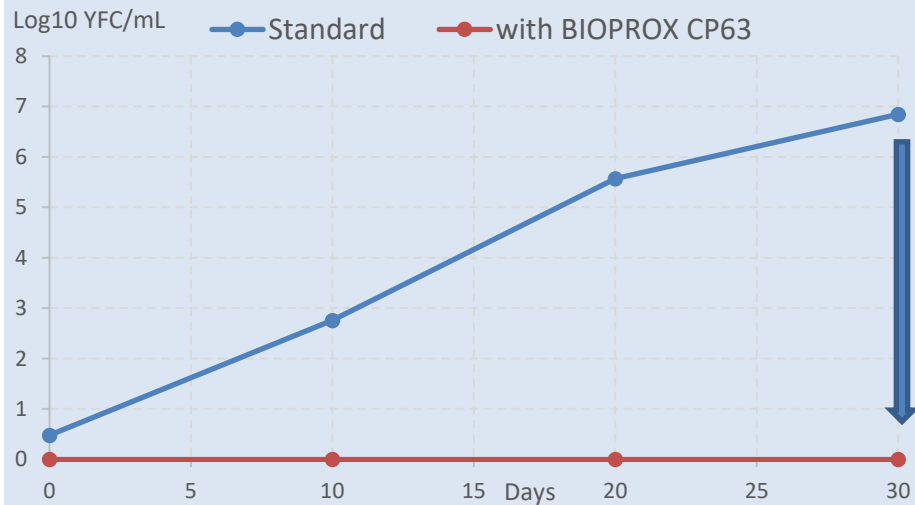
Why choosing BIOPROX® CP63



Proofs of inhibition in Fresh cheeses

- **Industrial validation on fresh cheeses** with different fat content without and with BIOPROX CP63 40D / 1000L
- Storage at 6 ° C for 40 days - The cold chain has been broken and the jars opened once a week for the sampling
- Monitoring of yeast and mold growth on YGC, organoleptic monitoring and diacetyl analysis

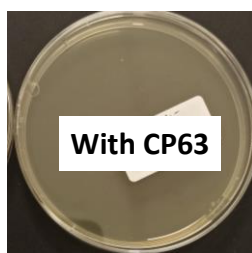
YEAST FOLLOW UP DURING SHELF LIFE



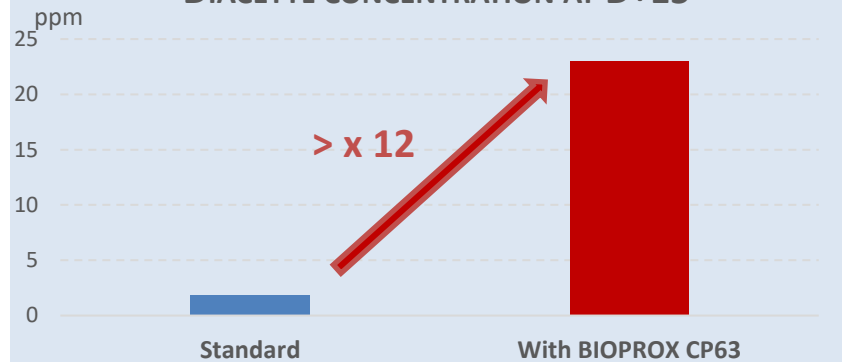
D+30
STANDARD WITHOUT
BIOPROX CP63



D+30
WITH BIOPROX CP63
+40D/1000L



DIACETYL CONCENTRATION AT D+15



Why choosing BIOPROX® CP63



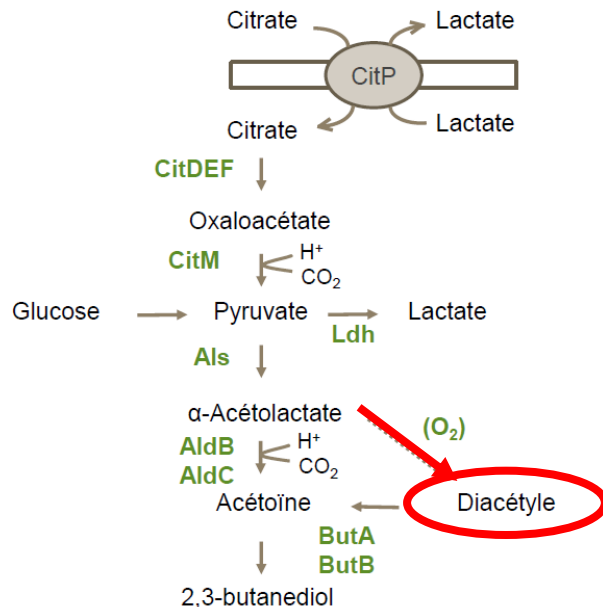
Bioprotection explained: *pHD* + scientific article*

Demonstration of the overproduction of diacetyl in antifungal strains:

- ✓ Acidifying cultures (*Lc lactis*, *Lc diacetylactis*): 1.8 mg/L
- ✓ *Lb rhamnosus* without antifungal activity: not detected
- ✓ *Lb rhamnosus* with antifungal activity: **16 mg/L**

Diacetyl is a volatile compound produced from citrate metabolism. It is responsible for the **creamy, buttery aroma**. Some strains of *Lb rhamnosus* allow its accumulation in the medium.

Diacetyl Production



Previous study from Aunsberg & al in 2015 in yoghurt (43°C – 7h). Diacetyl production:

Acidifying cultures: 3.1 mg/L

Lb paracasei DGCC2132: 13.5 mg/L

→ Growth inhibition of 2 strains of *Penicillium sp*

→ Specific screening of strains of *Lb rhamnosus* overproducers of diacetyl for antifungal activity

→ Selection of *Lb rhamnosus* from BIOPROX CP63

STRONG INHIBITION OF THE GROWTH OF A WIDE RANGE OF YEASTS AND MOULDS

BENEFITS :

- **Increase of end products shelf life (even in challenging storage conditions):**
 - ✓ Waste reduction
 - ✓ Better inventory management
- **Reduction of customer complaints & the risk of negative exposure on social networks**
- **Possibility to remove sorbate and other preservatives for clean label end products**



EXCEPTIONAL DEVELOPMENT OF DIACETYL AROMA OVER THE ENTIRE SHELF LIFE

BENEFITS :

- Stable organoleptic characteristics during shelf life
- High flavour development without gas production.
- An olfactory perception of the aroma as soon as the container is opened
- Limitation of sourness perception
- Clear organoleptic profile improvement of lower fat recipes



EASE OF TECHNOLOGICAL IMPLEMENTATION:

- No influence of BIOPROX CP63 addition on acidification profile
- No influence of BIOPROX CP63 addition on post acidification profile
- No modification of the ingredient list on the packaging

BENEFITS: Easy and quick to set up even in existing recipes



BIOPROX CP63 CAN BE USED IN MULTIPLE APPLICATIONS* AT 40D/1000L :

- Fermented milks (ex: leben, kefir type...),
- Fresh cheeses, quark, twarog, cottage cheese
- Sour cream, Butter
- Feta type, Goat fresh cheese...

To obtain optimized results with BIOPROX CP63, the fermentation temperature should be below 34°C

* The only restriction of usage is for soft cheeses ripened with moulds & yeasts (ex Camembert type)



ADDITIONAL SLIDES

INHIBITION PROOFS IN DIFFERENT APPLICATION:

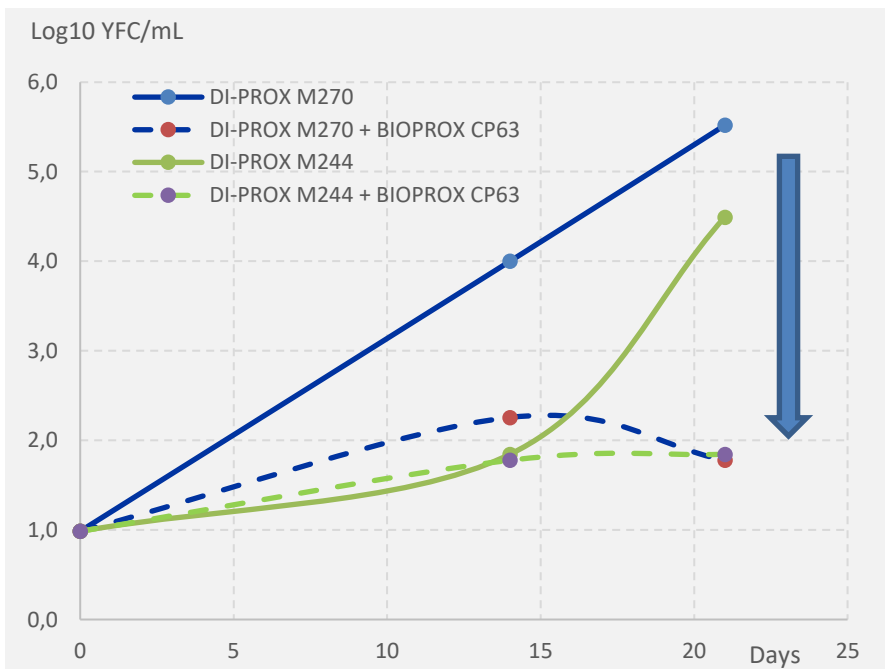
- Fermented milk
- Butter (NIZO type)

Why choosing BIOPROX® CP63



Proofs of inhibition in fermented milk*

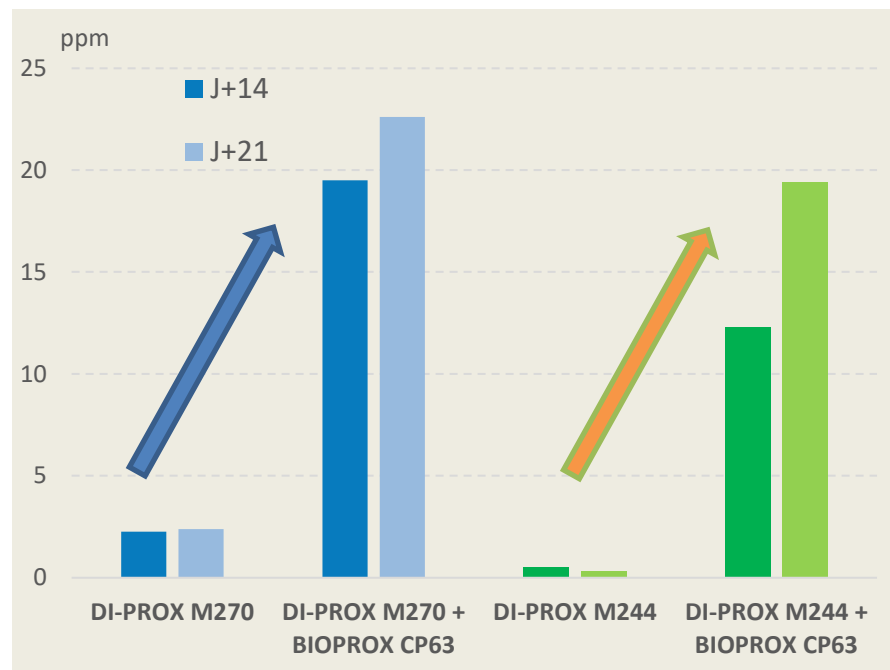
Influence of the addition of **BIOPROX® CP63** on **yeast growth**** during storage at 4 °C



➡ Proven efficiency against yeasts growth during shelf life

** *Candida lusitanae*

Influence of the addition of **BIOPROX® CP63** on the **diacetyl production** during shelf life



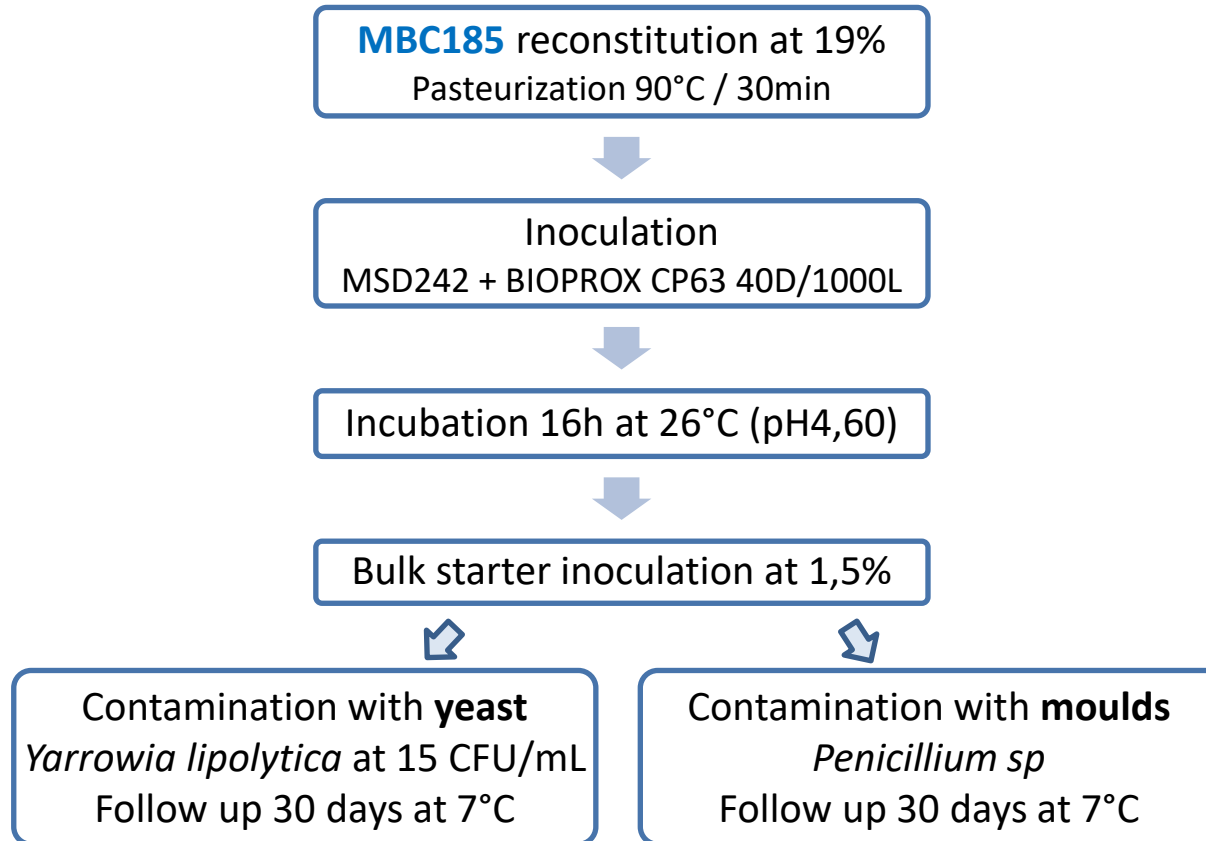
➡ High influence of BIOPROX CP63 addition regarding diacetyl – creamy flavor - production

BIOPROX CP63 at 40D/1000L

* Milk fermented at 23°C during 16h, end of fermentation at pH4,60 and storage at 4°C

Proofs of inhibition in NIZO BUTTER

→ Bulk starter preparation (2nd injection):



Enumeration on YGC

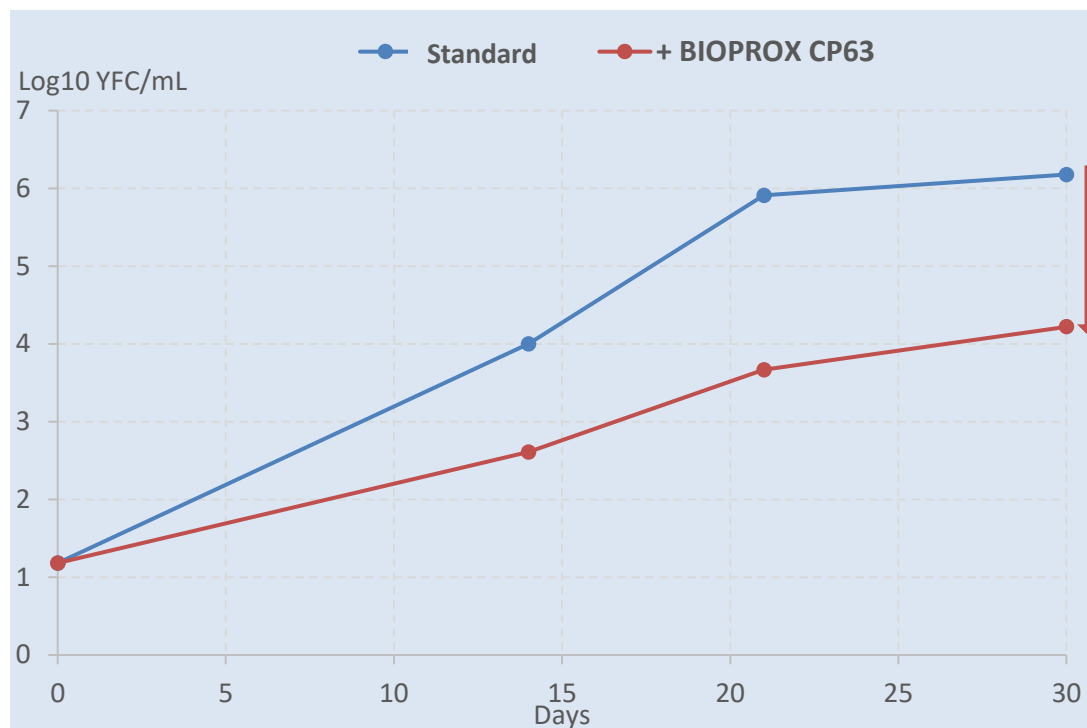


Diameter of the
colony
measurement

Proofs of inhibition in NIZO BUTTER

Results:

Influence of **BIOPROX CP63** addition in bulk starter on *Yarrowia lipolytica* growth during storage at 7°C



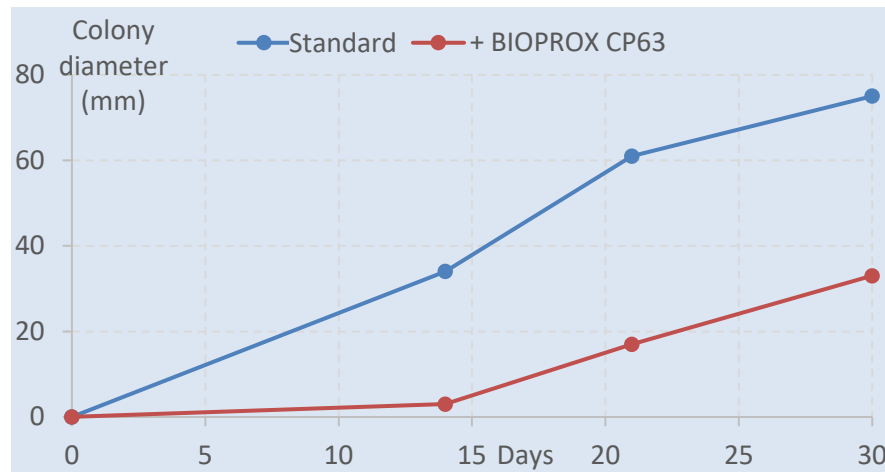
ADDITION OF BIOPROX CP63 IN THE BULK STARTER ALLOWS A REDUCTION OF 2 LOG OF YARROWIA LIPOLYTICA GROWTH DURING THE SHELF LIFE

Pourquoi choisir BIOPROX® CP63

Proofs of inhibition in NIZO BUTTER

Results:

Influence of **BIOPROX CP63** addition in bulk starter on *Penicillium commune* growth during storage at 7°C



Influence of **BIOPROX CP63** addition in bulk starter on *Penicillium turbatum* & *P. chrysogenum* growth during storage at 7°C

P. turbatum



Standard



+CP63

P. chrysogenum



Standard



+CP63

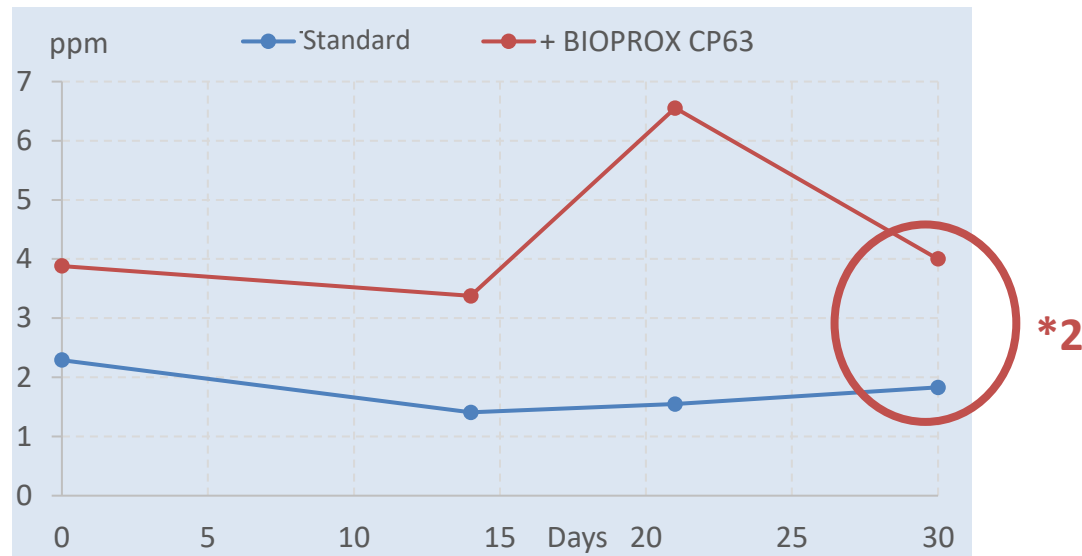
Why choosing BIOPROX® CP63



Proofs of inhibition in NIZO BUTTER

Results:

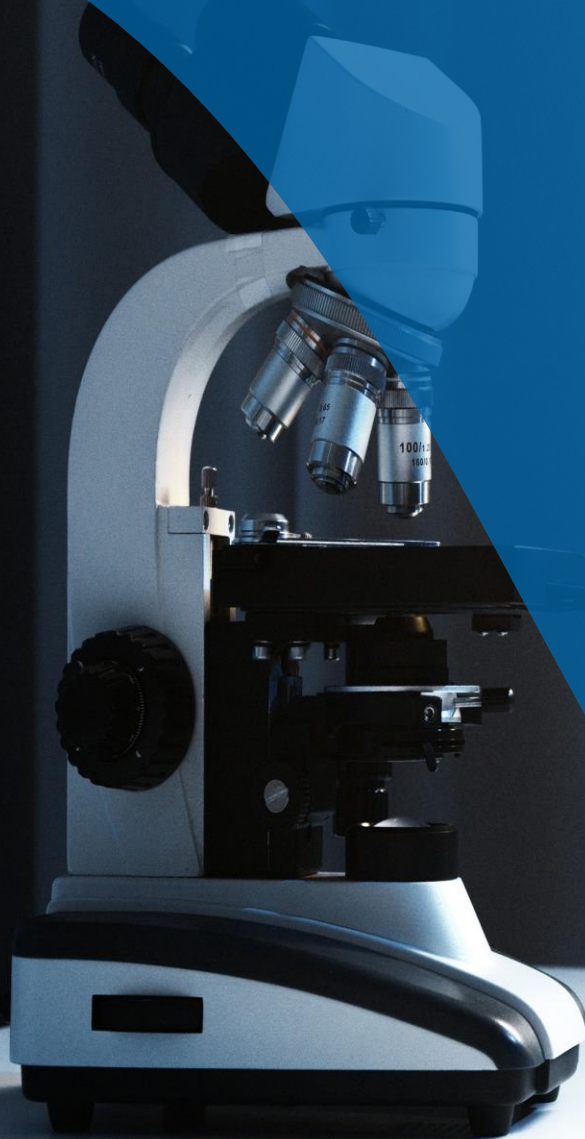
Influence of **BIOPROX CP63** addition in bulk starter on **DIACETYLE CONCENTRATION** during storage at 7°C



CONCLUSION: INFLUENCE OF BIOPROX CP63 ADDITION IN THE BULK STARTER FOR NIZO BUTTER:

- HIGH INHIBITION OF YEAST & MOULDS DURING THE SHELF LIFE ALLOWING A BETTER CONSERVATION DURING THE SHELF LIFE
- SLIGHT IMPROVEMENT OF DIACETYL PRODUCTION FOR FLAVOR IMPROVEMENT

BIOPROX® SP86



Why choosing BIOPROX® SP86



Lb fermentum selected for its bioprotective performances in mesophilic process

Inhibition profile on a wide range of Yeasts and Molds

	Yeasts					Molds				
BIOPROX®	<i>Debaryomyces hansenii</i>	<i>Kluyveromyces lactis</i>	<i>Yarrowia lipolytica</i>	<i>Candida kefyr</i>	<i>Pichia spp.</i>	<i>Mucor hyemalis</i>	<i>Aspergillus niger</i>	<i>Penicillum roquefortii</i>	<i>Penicillum chrysogenum</i>	<i>Alternaria</i>
SP86	+++	-	-	+	+++	+++	+	++	++	+++

On synthetic media – **Results interpretation:**

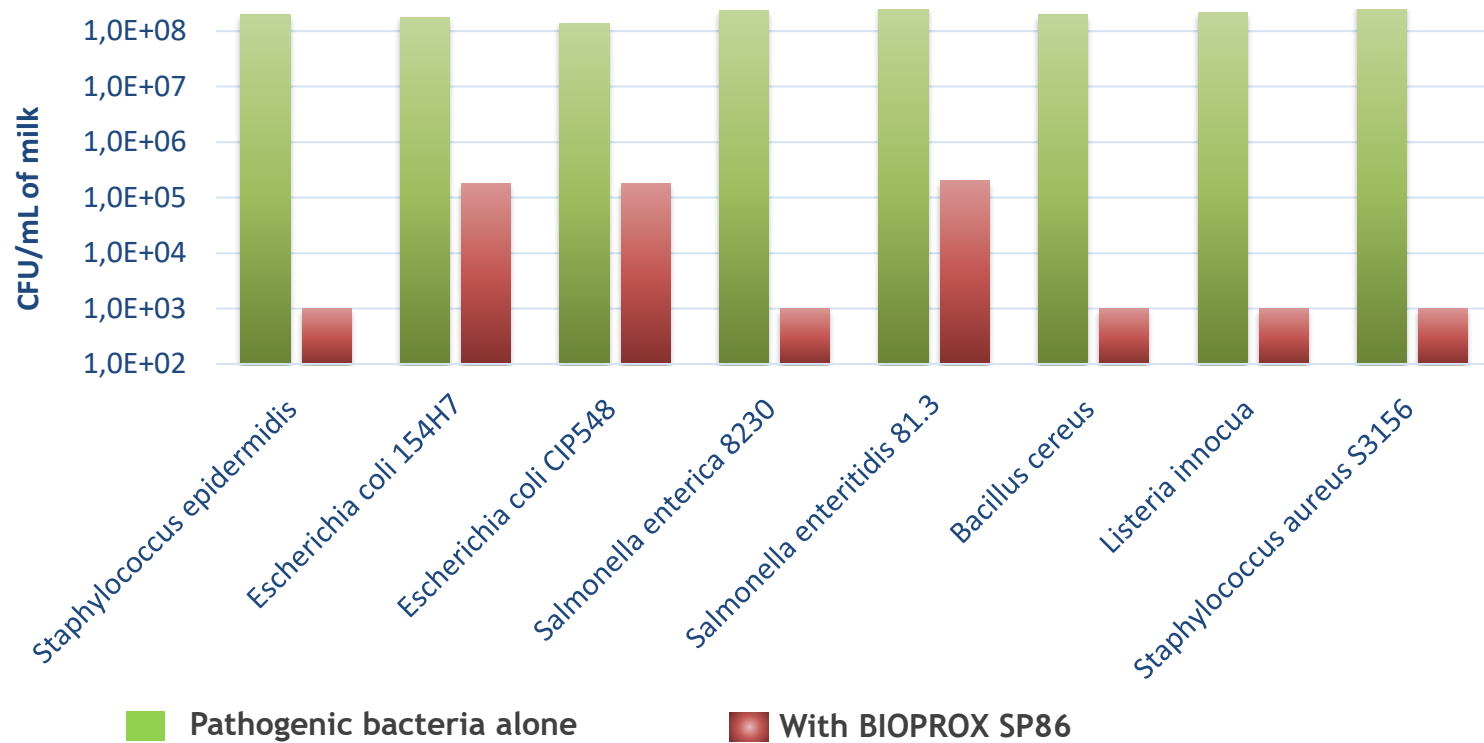
- Contaminant growth equals vs standard without bioprotective culture = **No inhibition**
- + Contaminant growth less important vs standard without bioprotective culture – **Low inhibition**
- ++ Limited contaminant growth – **High inhibition**
- +++ No contaminant growth – **Total inhibition**

Why choosing BIOPROX® SP86



*Inhibition of different **pathogenic** bacteria*

Evaluation of the growth of different pathogenic bacteria in milk with and without BIOPROX® SP86 after 24h at 37°C



Why choosing BIOPROX® SP86

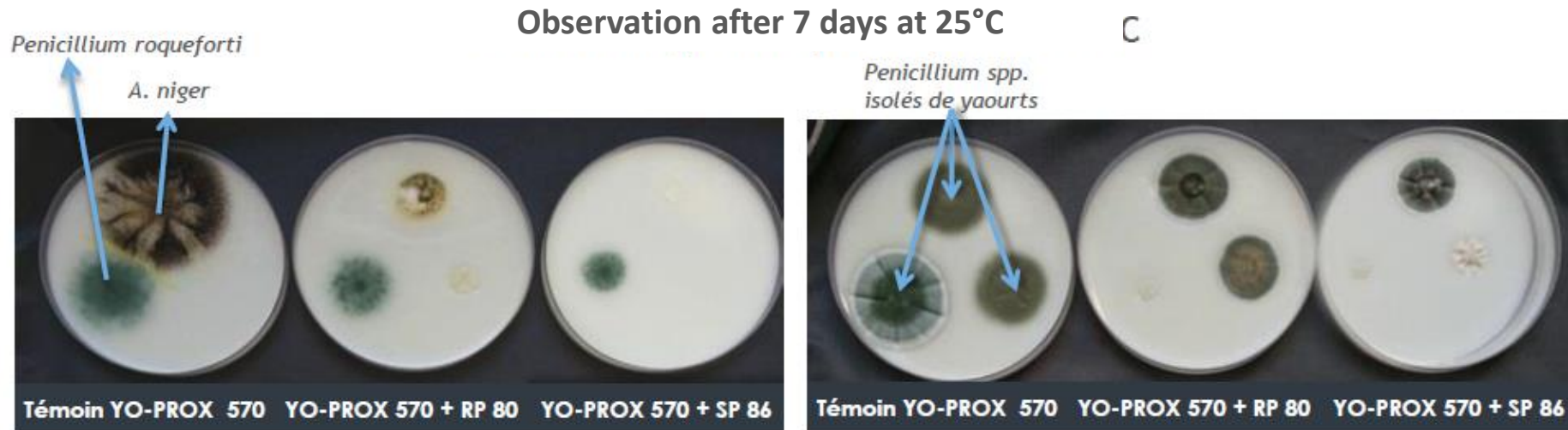


Inhibition proofs in Yoghurt application

Protocol: Yoghurt production with YO-PROX 570 50UA/1000L +- BIOPROX SP86 40 dosis/1000L – **Incubation at 43°C** – Fermentation stop at pH4,60

Addition of different molds at $10^3 - 10^4$ spores per deposit: *Aspergillus niger*, *Penicillium roqueforti*, *Penicillium sp* from customer yoghurt

Incubation at **25°C during 7 days**. Analysis at D+ 7.



→ High performances of BIOPROX SP86 addition regarding inhibition of different molds

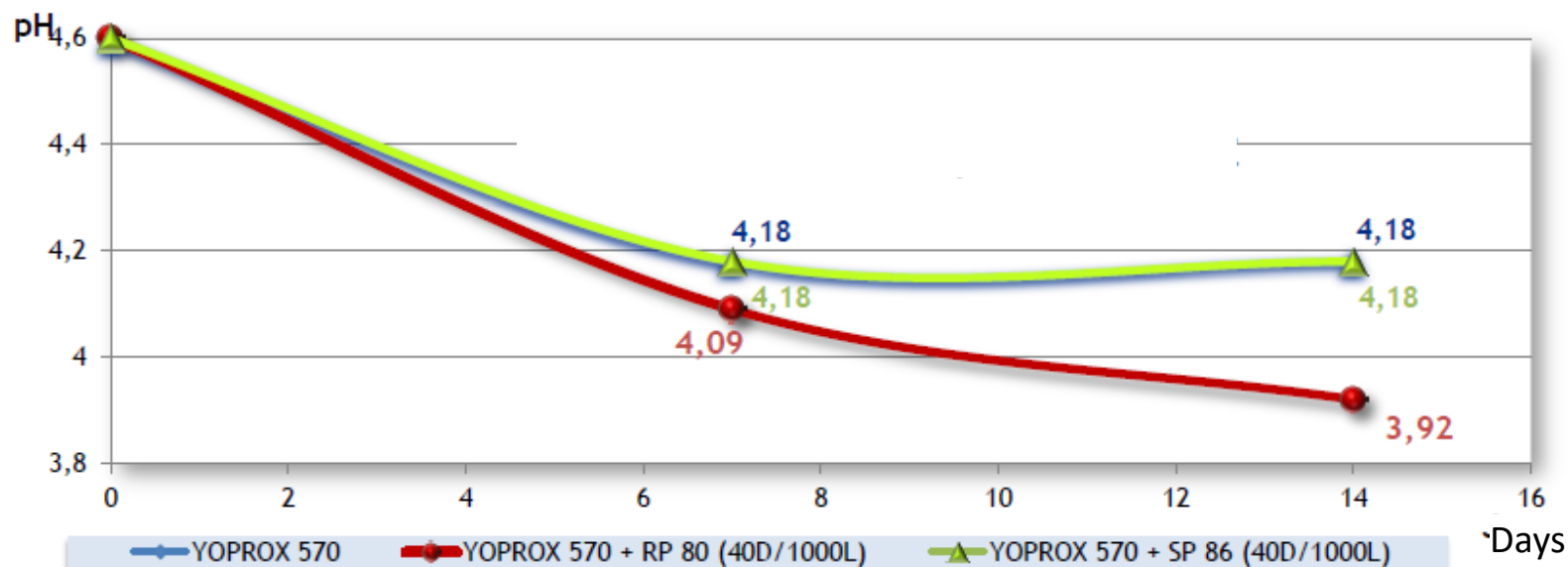
Why choosing BIOPROX® SP86



Very limited post acidification in Yoghurt application

Protocol: Yoghurt production with YO-PROX 570 50UA/1000L +- BIOPROX SP86 40 dosis/1000L – Incubation at 43°C – Fermentation stop at pH4,60
Incubation at 25°C during 14 days.

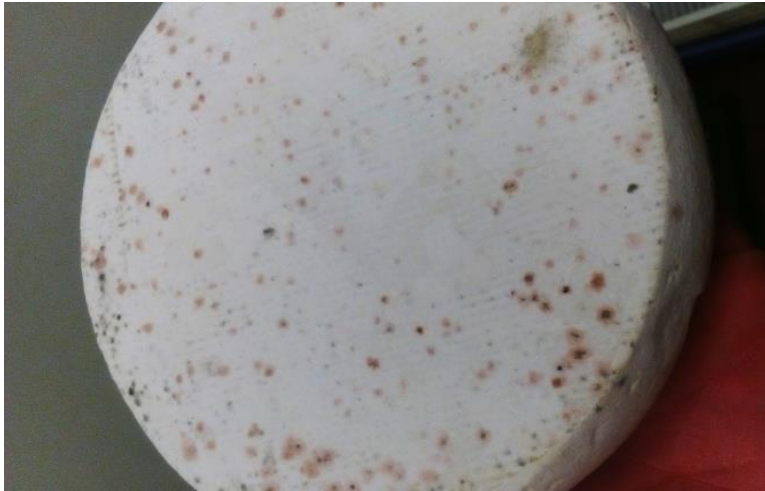
Post acidification in yoghurt stored during 14 days at 25°C



Why choosing BIOPROX® SP86



*Inhibition proofs in **Reblochon** cheese application*



Cheese without Bioprotection



Reblochon with BIOPROX® SP86

ADDITIONAL DOCUMENTS:



- *BIOPROX company*



Our internal skills

Our study and Discover Center



In numbers

- **+ 6% of turnover** invested in R&D
- **17 doctors, engineers & technicians** dedicated to the development of cultures and technical support
- May 2020 : **1000 m2 extension** of the R&D Centre
- **Partnership with the French scientific network**

Technical support & dedicated services

- **High level of responsiveness** appreciated by our customers.
- **Personalized analysis** and development of **tailor-made solutions**.
- **Considerable technical expertise** (from fermented milk to matured cheese).
- **Toll manufacturing contract**.

Production capacity

+€ 13 M

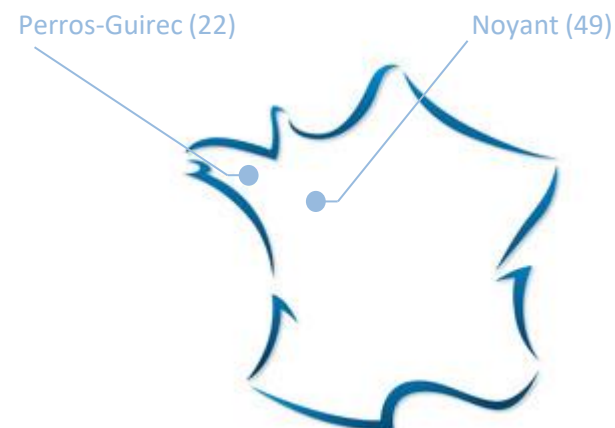
invested over the
past

10 years

Our production sites



- ✓ Scientific **reliability**
- ✓ **Quality**
- ✓ **Diversification**
- ✓ **Flexibility** and **adaptability**
- ✓ Sustainable and natural biotechnological solutions
- ✓ Collection of **strains**
- ✓ Selection and identification
- ✓ **Improvement** of the technological process
- ✓ Development of **new products**



8

Lyophilizers



Fermentation and Lyophilisation



3

Fermenters





THANKS

Contact:
info@bioprox.com