BIOPROTECTION
HOW TO USE THIS LIVING TECHNOLOGY

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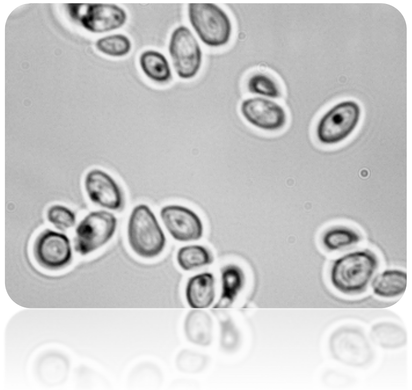
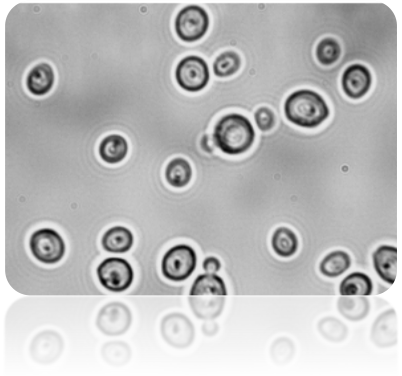
Non-*Saccharomyces* yeasts | The good, the bad and the ugly

Torulaspora delbrueckii
- Aroma and mouthfeel
- **BIO**Protection

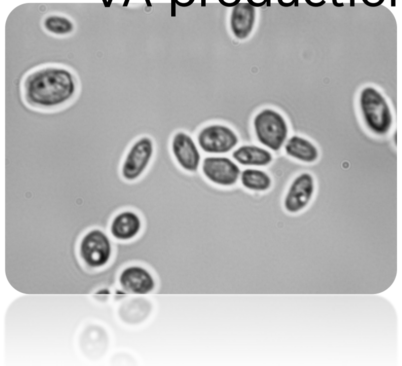
Metschnikowia pulcherrima
- **BIO**Protection
- Lower ethanol production



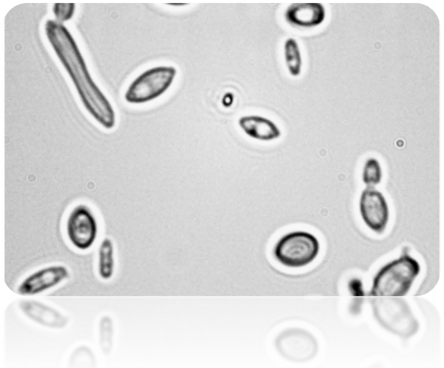
Lachancea thermotolerans
- Lactic acid production
- Lower ethanol production



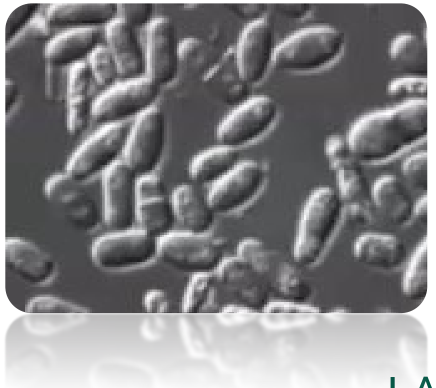
Hanseniaspora uvarum
- Common on grapes
- VA production



Brettanomyces bruxellensis
- Spoilage yeast



Schizosaccharomyces pombe
- Malic acid degradation



LAFFORT® non-Saccharomyces PORTFOLIO

1. BIOProtection

2. Aromatic optimization

3. BIOAcidification

LAFFORT® BIOProtection

- **Use of microorganisms during pre-fermentative phases to:**

Alternative to the **antiseptic role of SO_2**

- Colonize the medium
- Limit the development of the indigenous microflora

Alternative for the **antioxidative role of SO_2**

- Consume dissolved oxygen

ZYMAFLORE® ÉGIDE*TDMP*

- *50 % M. pulcherrima*
- *50 % T. delbrueckii*

Combine advantages of both species in very different inoculation situations…

TD	MP
Less sensitive to SO_2	Weak fermentative activity
Implantation capacity	Robustness when not rehydrated
Robustness to cold ++	Robustness to cold +++

Spraying **ZYMAFLORE® EGIDE*TDMP*** on materials in contact with grapes.

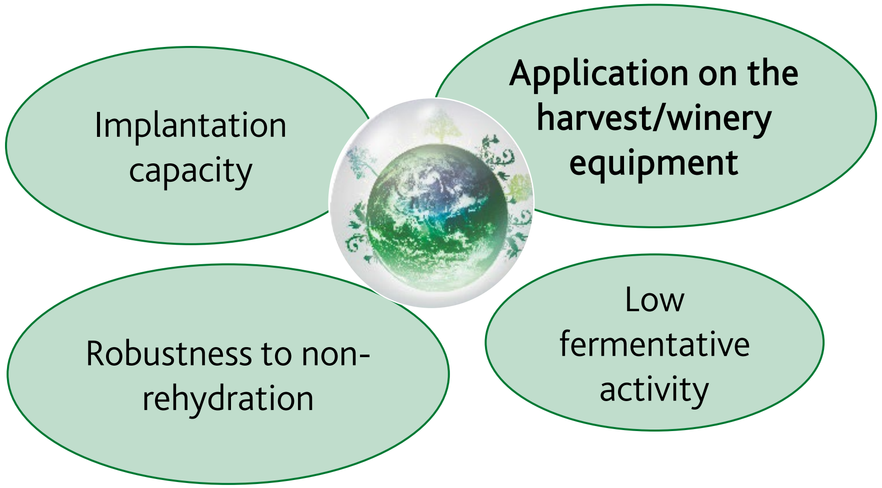
Key points to remember :

- Early contact of grapes with the selected non-*Saccharomyces* yeasts.
- Minimize the potential development of undesirable flora in hidden zone (juice/organic material)
- Easy to implement.

BIOProtection LAFFORT®

ZYMAFLORE® EGIDE TDMP

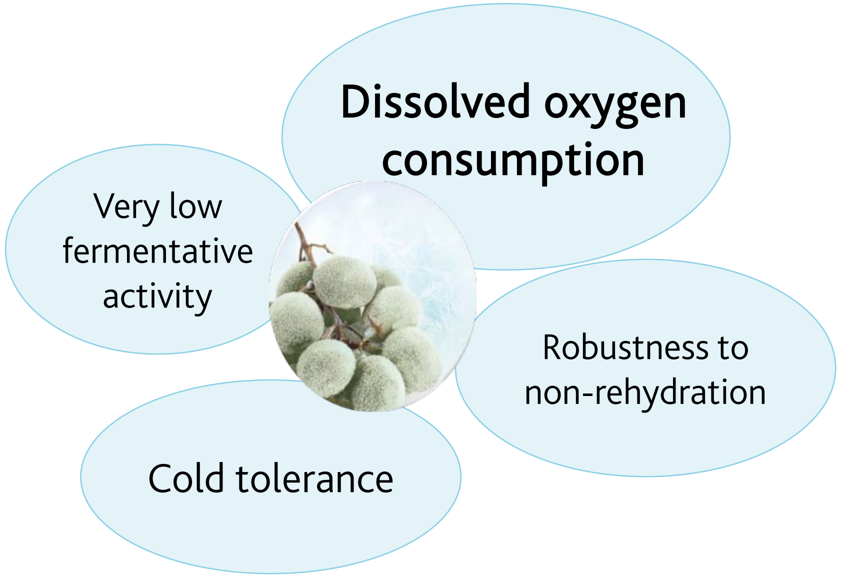
Torulaspora delbruekii & Metschnikowia pulcherrima



- Application on the harvest/winery equipment.
- Vatting of grapes
- Between pressing and racking of grape juice
- Rehydrated or not
- Dosage: 2-5 g/hL

ZYMAFLORE® KHIO MP

Metschnikowia pulcherrima



- Application during pre-fermentatative phases at low temperatures
- Cold maceration grapes
- Stabulation of grape juices
- Rehydrated or not
- Dosage: 2-5 g/hL

BIOProtection - Summary

- Lower VA (acetic acid, ethyl acetate)
- More secure implantation of the inoculated *Saccharomyces cerevisiae* strain.
- Less SO_2 binding compounds (e.g. acetaldehyde)
- Superior organoleptic profile (purity, fruit character)

LAFFORT® non-*Saccharomyces* PORTFOLIO

ZYMAFLORE® ALPHA^{TD}

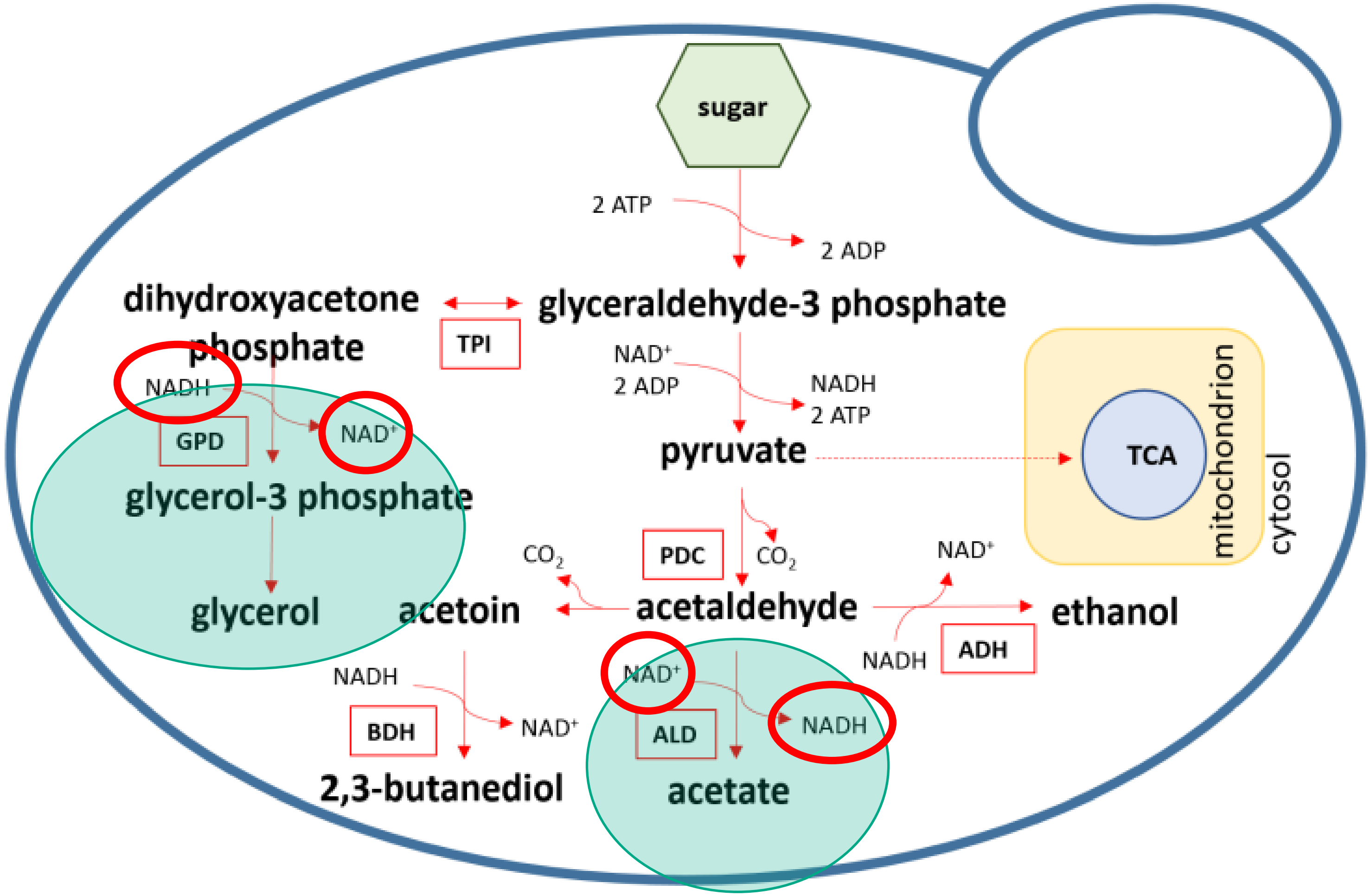
1. **BIO**Protection
2. Aromatic optimization
3. **BIO**Acidification

Modulation of acetic acid by yeasts

The production of acetic acid by *S. cerevisiae* is favored under **hyperosmotic conditions (i.e., matrices rich in sugars).**

Link between glycerol production and acetic acid
→ Balance between reduced and oxidized forms of NAD [NAD+]/[NADH].

Selection of *S. cerevisiae* strains, **but also <u>non-*Saccharomyces* yeasts.</u>**



Torulaspora delbrueckii : Low volatile acidity production

The yeast *Torulaspora delbrueckii* is not very sensitive to high sugar levels → low VA production.

➡

First proposed application:

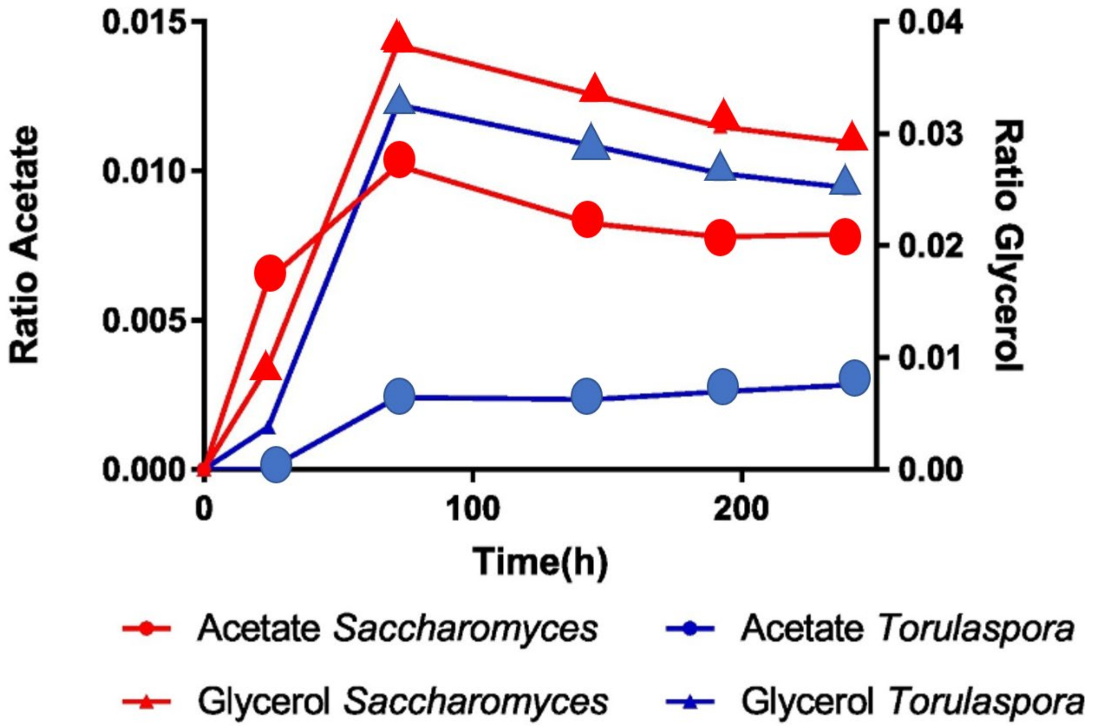
Mixed fermentations of *T. delbrueckii* and *S. cerevisiae* to reduce the VA of sweet wines (↓ 50 %).

Bely et al, 2008

High gene expression - **routing to glycerol**

High expression of the Pyruvate decarboxylase and Alcohol dehydrogenase genes - **routing to ethanol**

Low expression of the acetaldehyde dehydrogenase gene - **Lower acetate production**



Evolution of glycerol and acetic acid production during AF.

Tondini et al, 2019

LAFFORT® non-Saccharomyces PORTFOLIO

ZYMAFLORE® OMEGA^{LT}

1. BIOProtection

2. Aromatic optimization

3. BIOAcidification

Technical characteristics of **ZYMAFLORE® OMEGA*LT***

1. **Enological use:**
   - Co-inoculation (simultaneous inoculation) or sequential inoculation with a strain of *S. cerevisiae.*
   - SO_2 addition < 40 ppm (or less at low pH).

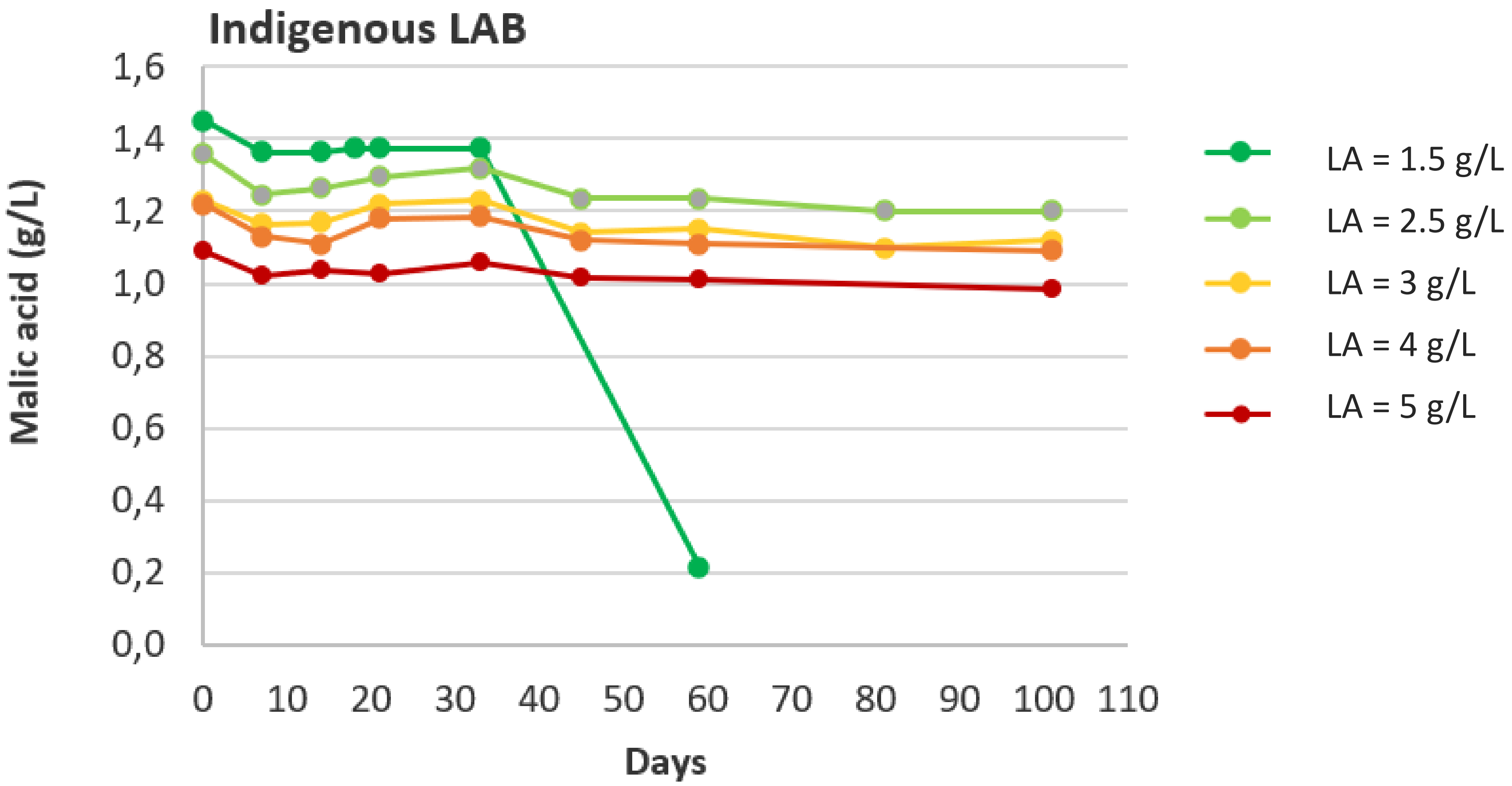
2. **Lactic acid production:**
   - **Variable** depending on the conditions of vinification, primarily temperature, type of inoculation and SO_2 addition.
   - In optimal conditions > **15 g/L** → **blending component!**

3. **Nitrogen demands:**
   - In co-inoculations, adapted to the requirements of *S. cerevisiae* and enological conditions
   - In sequential inoculations, an addition of **100 - 130 mg/L N coinciding with the inoculation of *S. cerevisiae*** compensates for the nitrogen consumption by **ZYMAFLORE® OMEGA*LT*.**

Technical characteristics of **ZYMAFLORE® OMEGA^{LT}**

Inhibition of MLF

- **Indigenous MLF** is significantly prolonged or **blocked** at concentrations **> 2 g/L of lactic acid**.



Merlot; pH < 3,4 ; < 14 % vol. Alc.

LA = lactic acid

Parameters affecting the development of **ZYMAFLORE® OMEGA^{LT}**

Favorable parameters

- **High temperature (> 20 °C)**
- **Sequential inoculation**
- **Absence of SO_2**
- **Higher dose**
- Low pressure of native flora
- High pH
- Rehydration with SUPERSTART®
- Other parameters (e.g. nitrogen nutrition, trace elements, oxygen...)

Limiting parameters

- **Low temperature (< 18°C)**
- **Co-inoculation**
- **Presence of SO_2**
- **Lower dose**
- Strong pressure of native flora
- Low pH
- Rehydration without SUPERSTART®
- Other parameters (e.g. nitrogen nutrition, trace elements, oxygen...)

« Fresh tank » concept : Acidifying tank

- Production of a BIOAcidified **tank as a blending component.**
- Corrective element for other **tanks** in terms of acidity and aromatic freshness

  → **current or previous vintages.**
- Use conditions favoring strong expression of **ZYMAFLORE® OMEGA*LT*** e.g.
  - temperature > 18°C (64°F),
  - low SO_2,
  - Inoculate a robust *S. cerevisiae* strain...)

LAFFORT® non-Saccharomyces PORTFOLIO

1. BIOProtection

ZYMAFLORE® EGIDE^{TDMP}

Grapes and must:
20 - 50 ppm
With or without rehydration
Direct application on equipment or grapes

ZYMAFLORE® KHIO^{MP}

Grapes and must:
20 - 50 ppm
With or without rehydration.
Adapted to extreme temperatures (0 - 6°C).
Strong capacity to consume dissolved oxygen.

LAFFORT® non-Saccharomyces PORTFOLIO

2. Aromatic optimization

ZYMAFLORE® ALPHA^{TD}

Enhanced aroma intensity and volume.
200 – 400 ppm
Sequential inoculation with *S. cerevisiae.*

3. BIOAcidification

ZYMAFLORE® OMEGA^{LT}

Lactic acid production.
Grapes and must:
200 – 400 ppm
co-inoculation or sequential inoculation with *S. cerevisiae.*