non-*Saccharomyces* wine yeast

Annicka Bunte 16 June 2009
History of yeast starters

- First starter culture: Müller-Thurgau 1890
- First commercial wine yeast starter: California 1964-65
- Today: 90% starter fermentations in California


- Process consistency gained at the expense of some positive wine qualities
Lost qualities associated with ‘‘wild’’ yeast

FRUIT.

COMPLEXITY.

MOUTHFEEL.
Reintroducing the good “wild” characters

- Aiming to reintroduce fruit, complexity and mouthfeel like spontaneous fermentations
- Keeping process control
- Screening of non-\textit{Saccharomyces} isolates
- Laboratory and field trials ensuring good vinification
- Safety aspects tested (low urea/ethyl carbamate)
- Sensoric impact evaluated in field trials
Chr Hansen screening of wine related “wild” yeasts started in the 1990’s

- Brettanomyces / Anamorph Dekkera
- Candida
- Cryptococcus
- Debaromyces
- Hanseniaspora / Anamorph Kloeckera
- Hansenula
- Kluyveromyces
- Torulaspora
- Metschnikowia
- Pichia
- Rhodotorula
- Saccharomyces
- Saccharomycodes
- Schizosaccharomyces
- Zygosaccharomyces
**Saccharomyces** drives the alcoholic fermentation

*S. cerevisiae*  
*T. delbrueckii*

- **Glucose/fructose (g/L)**
- **Log CFU (ml)**

- Sugar consumed
- Residual sugar

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[Image of graphs showing fermentation processes involving *Saccharomyces* and *T. delbrueckii* with glucose and fructose levels over time, along with CFU counts.]

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[Logo of CHR HANSEN]
non-*Saccharomyces* mixed starters

- *Saccharomyces* yeast needed to finish fermentation
- non-*Saccharomyces* yeasts and *Saccharomyces* yeast should ferment under similar conditions
- 2003 big scale field trials
- 2004 first non-*Saccharomyces* containing starter cultures introduced by Chr Hansen
Temperature optimum similar, temperature tolerance differs slightly.
HARMONY.nsac & MELODY.nsac

2 Blends of:

- Torulaspora delbrueckii (Td)
- Kluyveromyces thermotolerans (Kt)
- Saccharomyces cerevisiae (Sc)

20% mild effect
40% strong effect
SYMPHONY.nsac & RHYTHM.nsac

- 2 Blends of:
  - *Kluyveromyces thermotolerans* (Kt)
  - *Saccharomyces cerevisiae* (Sc)

<table>
<thead>
<tr>
<th>SYMPHONY</th>
<th>RHYTHM</th>
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<tbody>
<tr>
<td>20% mild effect</td>
<td>40% strong effect</td>
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</table>
Example fermentation Cabernet sauvignon, HARMONY.nsac

Saccharomyces drives the fermentation

non-Saccharomyces numbers decline over time, like in spontaneous fermentation

Figure 4
Mixed starters vs pure *Saccharomyces* cultures

Data kindly provided by University of Neustadt, Germany and E: Begerow GmbH & Co, Germany
Experience with starters

- Improves mouthfeel and smoothness / roundness of wines
- Increases longevity of flavours and aromas

- Wineries interested in experimenting with own ratios, inoculation schemes and favourite *Saccharomyces cerevisiae* commercial strains

- PRELUDE.nsac single strain *Torulaspora delbrueckii*
Saccharomyces drives alcoholic fermentation: growth

single strain non-Saccharomyces in P. blanc 2008

![Graph showing growth of CFU/ml over days after inoculation](image)
Saccharomyces drives alcoholic fermentation: sugar

single strain non-Saccharomyces in P. blanc 2008

Days after inoculation

sugar (g/l)
Saccharomyces drives alcoholic fermentation: ethanol

single strain non-Saccharomyces in P. blanc 2008

Days after inoculation

ethanol % (V/V)

Prelude
non-*Saccharomyces* contribute little to SO2

**FSO2 & TSO2 produced by single strain cultures 9 days after inoculation**

- MERIT.ferm
- T. delbrueckii
- K. thermotolerans

Day and SO2

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Prelude

yogest culture
non-\textit{Saccharomyces} made little difference on standard fermentation parameters (field trials 2003)

RESULT1, X-expl: 8%, 8%  Y-expl: 37%, 14%
**S. cerevisiae drives the alcoholic fermentation: field trials 2003**

<table>
<thead>
<tr>
<th></th>
<th>Finished first</th>
<th>Finished last</th>
<th>Total No. reported trials</th>
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</thead>
<tbody>
<tr>
<td>S. cerevisiae</td>
<td>4</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>80% NS</td>
<td>0</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>&quot;PRELUDE&quot;</td>
<td>0</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>&quot;SYMPHONY&quot;</td>
<td>3</td>
<td>1</td>
<td>14</td>
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</tbody>
</table>
Always use single strain *Torulaspora delbrueckii* (PRELUDE) with a commercial *Saccharomyces cerevisiae*!
Torulaspora delbrueckii (PRELUDE) in Pinot blanc

Average 20% M1/80% T. delbrueckii

Subst/Prod. (g/L vol%)

Days

Log CFU/ml

Total cfu
T. delbrueckii
M1
Glucose/10
Fructose/10
Ethanol
Glycerol
Fast MLF with non-\textit{Saccharomyces}

Malolactic fermentation by Viniflora LS Oenos in coinoculated Pinot blanc (Germany 2005) Malic acid degradation.

![Graph showing malic acid degradation over days after inoculation for different treatments including control non-inoc, Yeast starter X + VFO LS, NERIT + VFO LS, RHYTHM + VFO LS.](image-url)
# Select your yeast product

<table>
<thead>
<tr>
<th>Saccharomyces cerevisiae</th>
<th>Non-Saccharomyces species</th>
</tr>
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<tbody>
<tr>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>High sugar content</td>
<td>Palate weight strong effect</td>
</tr>
<tr>
<td>mild ‘wild effect’</td>
<td>strong ‘wild effect’</td>
</tr>
<tr>
<td>60%</td>
<td>0%</td>
</tr>
<tr>
<td>strong effect</td>
<td></td>
</tr>
</tbody>
</table>

| 20%                      |
| HARMONY                  |
| MELODY                   |

| 40%                      |
| SYMPHONY                 |
| RHYTHM                   |

| 0%                       |
| MERIT                    |
| PRELUDE                  |
100% Torulaspora delbrueckii

To be used with your favorite Saccharomyces cerevisiae

Gives rounder, smoother mouthfeel

Extend palate weight and flavors

Used in white/ rosé and premium red wines to get additional complexity

ALWAYS use your favorite Saccharomyces cerevisiae in addition to PRELUDE.nsac
Experience with PRELUDE.nsac
South African field trials 2009

- Chardonnay: Inoculation of PRELUDE.nsac 5 days prior to *Saccharomyces cerevisiae* (commercial strain)
  - “Remarkable” increased mouthfeel, palate weight and creaminess.
  - Impact on red wines predicted to be very beneficial
  - Effect similar to addition of mannoproteins

- Sauvignon blanc: Inoculation of PRELUDE.nsac 2 days prior to *Saccharomyces cerevisiae* (commercial strain)
  - Preferred the PRELUDE.nsac treatment
  - Improved mouthfeel and length of flavours in the palate
  - Reduced VA notes
  - Maintain Sauvignon blanc aromas produced by Saccharomyces
Experience with PRELUDE.nsac
South African field trials 2009

- Chardonnay and Sauvignon blanc: PRELUDE.nsac pre- and co-inoculated with *S. cerevisiae* (commercial strain)
  - PRELUDE.nsac wines increased mouthfeel and roundness
  - Allows *Saccharomyces cerevisiae* to express flavour and fermentation characteristics
  - Co-inoculation preferred by most

- Shiraz trials with non-*Saccharomyces* single strain
  - Enhanced varietal character, enhanced colour and great mouthfeel, full bodied
  - Effect similar to addition of mannoproteins