“Moving Beyond H₂S: Breeding For Enological Traits”

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REVIEW OF THE PRESENTATION

1) Presenting the Company, the H₂S trait & selective breeding

2) New Yeast strains with enological traits
   a) Case study of High Glycerol yeast
   b) Case study of Thiol Releasing yeast

3) Summary
Canadian yeast innovation company
  • Founded in 2013
  • Head office: Vancouver, BC, Canada
  • 21 employees currently
  • Focus on yeast Development
Market oriented/Problem solver
Early focus on wine but other markets include:
  Cider, Beer, Distilled Spirits
GLOBAL DISTRIBUTION
HYDROGEN SULFIDE (H$_2$S)

• A common problem in winemaking
  > 20% of all fermentations
  – Rotten egg smell
• Reported sensory threshold is:
  – 0.9 – 1.5 ppb
• Below sensory threshold in wine – masking of fruit expression and character
• H$_2$S often produced during fermentation by *Saccharomyces cerevisiae* wine yeast
SRS PATHWAY

Extracellular

SO\textsubscript{2}
Sulfur dioxide

SO\textsubscript{4}\textsuperscript{2-}
Sulfate

SO\textsubscript{3}
Sulfite

S\textsuperscript{2-}
Sulfide

H\textsubscript{2}S

Intracellular

Nutrients

Cysteine
Methionine

SRS Pathway
4800+ strains

- Commercial
- Natural isolates
- Laboratory

H₂S scale

High  Med  None
COMMERCIALIZATION: CLASSICAL BREEDING

Sporulation

Mating

2n

n

2n

Hybrid yeast

Backcrossing (repeat)

Renaissance Yeast H2S-preventing strain

Strain X

H2S preventing strain
COMMERCIALIZATION: YEAST MATING

1 Similar to plants, some industrial yeast strains may contain multiple or odd sets of chromosomes (triploid, polyploid, or aneuploid).
• First steps of AF - Protector of Biomass
• 3rd major component 6-9 g/L
• Sweetness and mouthfeel sensations
RESEARCH WORK PLAN

Hybridization

High Glycerol Strain

No H₂S Strain with favorable enological traits
HYBRIDS SPORULATION

- Good kinetics
- Low SO₂ production
- Low VA production

Best with all the desirable characteristics
<table>
<thead>
<tr>
<th>Metabolic traits</th>
<th>Physical traits</th>
<th>Sensory traits</th>
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<tbody>
<tr>
<td>• Residual sugar</td>
<td>• Fermentation kinetics (CO2 weight loss)</td>
<td>• General flavor/aroma profile (benching)</td>
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<tr>
<td>• Total acidity</td>
<td>• Temperature tolerance</td>
<td>• Off-flavor/aroma production (benching)</td>
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<tr>
<td>• Free SO2</td>
<td>• Killer character</td>
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<tr>
<td>• Total SO2</td>
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<td>• H2S production</td>
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<td>• pH</td>
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<td>• Yeast Assimilable Nitrogen (YAN)</td>
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<tr>
<td>• Glucose</td>
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<td>• Fructose</td>
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<td>• Glycerol</td>
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<td>• Organic acids:</td>
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<tr>
<td>lactic acid, acetic acid, citric acid,</td>
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<td>malic acid</td>
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<tr>
<td>• Acetaldehyde</td>
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<tr>
<td>• Ethanol</td>
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<td>• Enzymatic traits</td>
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</table>
All wines were analysed by HPLC
NOVELTY STRAINS WITH HIGH GLYCEROL

![Bar chart showing glycerol levels for different strains and variants.]

- Andante
- Maestoso
- NT202
- RY Glycerol Hybrid
- RY Glycerol Variant 1
- RY Glycerol Variant 2

Glycerol g/L

Levels: 0, 2, 4, 6, 8, 10, 12, 14
Volatile Thiols Releasing Strain
• Early **1990** Volatile Thiols identified

• Responsible for: *Green pepper, boxwood, broom, eucalyptus, blackcurrant buds, rhubarb, passion fruit, white peaches, gooseberries etc.*

• Thiols **4MMP, 3MH, 3MHA**

• Focus on *beta-Lyase activity* – Thiols releasing strain
beta – LYASE ACTIVITY

Padilla and al. 2016
Hybridization

Most Intense Volatile thiols strain

Best Strain No H₂S production

SAME PROCEDURE

No H₂S Yeast

No H₂S Yeast

No H₂S Yeast

No H₂S Yeast

Yeast

Yeast

Yeast

Yeast
Plating methods:

- Enzymatic Phenotypes
SENSORY ON VOLATILE THIOLS STRAIN

- ES181
- Vin 13
- Research Strain 1

- ES181
- Vin 13
- Research Strain 2

- ES181
- Vin 13
- Research Strain 3

- Onion
- Guava
- Banana
- Citrus
- Acidity
- H2S
- Mercapt...
2017 PRODUCTS

Viva (Vivace)
- Chardonnay, Pinot Gris, Fruit Wine, Sparkling Wine

Allegro
- Sauvignon Blanc, Chardonnay, Semillon, Gewurztraminer, Chenin Blanc, Riesling

Avante (Andante)
- Cabernet Sauvignon, Zinfandel, Syrah, Sangiovese

Muse (Maestoso)
- Cabernet Sauvignon, Merlot, Zinfandel, Cabernet Franc, Syrah, Petit Verdot

Brio
- Pinot Noir, Grenache, Gamay Noir, Zinfandel

Ossia Organic
- White wine, Red Wine, Fruit Wine, Sparkling wine

Fresco
- Cider
SUMMARY

- H$_2$S prevention
- Breeding improved features
  - Resulting in improved wine quality
- Non-GMO: created by natural breeding between different wine strains
YOUR NEXT

Masterpiece

AWAITS

PREMIUM YEAST
CLASSICALLY BRED
ZERO $H_2S$