WINE SHELF LIFE IMPROVEMENT

Eglantine Chauffour, Enartis USA
• What is Wine Shelf life?

• The Redox chemistry of the wine
  • Redox potential
  • Oxidation reactions

• Managing oxidation reactions during winemaking process

• Innovative tools to evaluate wine resistance to oxidation and manage oxygen

• Q&A
THE RIGHT PRODUCT AT THE RIGHT TIME
WINE EVOLUTION AND LONGEVITY

REDUCTION

OXIDATION

POLL
Transfer of electrons
- Oxidation = loss of electron
- Reduction = gain of electron

Redox potential (mV) = tendency to gain or yield electrons

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Eh (mV) ph 3.5</th>
<th>Eh (mV) ph 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2O2 + 2H + 2e = 2H2O</td>
<td>1570</td>
<td>1540</td>
</tr>
<tr>
<td>O2 + 4H + 4e = 2H2O</td>
<td>1020</td>
<td>990</td>
</tr>
<tr>
<td>Fe3+ + 1e = Fe2+</td>
<td>770</td>
<td>770</td>
</tr>
<tr>
<td>O2 + 2H + 2e = H2O2</td>
<td>490</td>
<td>460</td>
</tr>
<tr>
<td>Cu2+ + 1e = Cu+</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>S + 2H + 2e = H2S</td>
<td>-70</td>
<td>-100</td>
</tr>
<tr>
<td>Acetaldehyde + 2H + 2e = Ethanol</td>
<td>-410</td>
<td>-440</td>
</tr>
</tbody>
</table>
OXIDO-REDUCTION REACTIONS

Enartis Pro XP
Claril HM
Stabyl MET

Enartis Stab SLI
PVPP
Claril HM

SO₂
Ascorbic acid

SO₂
Oak tannin

GSH
Tannin

Browning

Strecker reaction with amino acids

Phenolic polymerization

Hydroperoxyl radical

Quinone

Ethanol

Acetaldehyde
REMOVE CATALYZERS

Prevent oxidation
Improve wine redox stability
Any time of the wine life!
HOW IMPORTANT IS THE ROLE OF METALS IN WINE?

Danilewicz, J. (2007)
RESIDUAL COPPER AND VSC

MeSH - Shiraz

H₂S - Shiraz

Relationship between Cu/Fe and H₂S

Cu/Fe ratio critical to H₂S levels.

AWRI,
Marlize Bekker, ASEV, 2017
PVI/PVP AND CHITOSAN

**PVI/PVP**

Cu²⁺ > Au²⁺ = Ag²⁺ > Fe³⁺ > Mn²⁺ > Al³⁺

**Chitosan**

Fe³⁺ > Cu²⁺ > Au²⁺ = Ag²⁺ > Mn²⁺ > Al³⁺
RESULTS...

**Reduction of Metals in Wine in % Comparing to Control**

- **Cu**: 77% at 10 g/L, 86% at 50 g/L
- **Fe**: 57% at 10 g/L, 86% at 50 g/L
- **Al**: 20% at 10 g/L, 86% at 50 g/L

**Oxidative Stability**

- **Control**: Not Stable
- **Enartis Pro FT**: Stable

**Claril HM**
OXYGEN RADICAL SCAVENGING
TAN SLI: OXYGEN SCAVENGER

- Scavenge radicals and limit oxidation
- Stabilize redox potential
- Binds with mercaptans to treat reduction

Applications:
- Transfer, racking
- Pre-bottling
- Treat reduction
- Extend wine shelf life

Δ420 - 6 DAYS AFTER 2 RACK OFF

- 8% (Δ420 after 6 days [%])
- 0% (Control)
- 0% (Tan SLI)
REDUCE SUBSTRATES/PRECURSORS

Phenolic compounds
Dissolved oxygen
Reduce VSC precursors
ENARTIS STAB SLI
- ‘Active’ lees
- PVPP
- Oak tannin

Wine after 6 months ageing on shelf. Control VS Stab SLI at 20 g/hL
Yeast metabolites
- Yeast nutrition
- SH amino acids

Precursors
- Elemental S
- SH amino acids
- Unknown

Oxygen management
- Yeast metabolism
- Quinone formation
- Oxidation of mercaptans to disulfides

---

**Yeast nutrition**

**SH amino acids**

**Elemental S**

**SH amino acids**

**Unknown**

**Oxidation**

**Mercaptans**

**DiSulfides**

**Ethanol, methanol, wine compounds, lees release**

**Oxidation**

**Hydrogen sulfide**

**Methanethiol**

**H₂S**
SO₂ as a reductive agent: - 60 mV

Ascorbic acid as reductive agent: - 140 mV
Check your wine stability
- Browning test
- Oxidative stability
- Pinking test
- Antioxidant Capacity (RedOX/CaOX)

Oxygen management during bottling

Choice of closure
Wine Shelf life: the right product at the right time

Redox potential is essential

Stabilize redox potential

- Eliminate metals
- Tan SLI

Limit precursors of oxidation and/or reduction

- Remove catechins with fining or Stab SLI
- Limit dissolved oxygen
- Yeast nutrition
- Limit reductive lees ageing

Check wine stability before bottling

• Interaction of Sulfur Dioxide, Polyphenols, and Oxygen in a Wine-Model System: Central Role of Iron and Copper. Danilewicz, 2007

• The Redox potential of Juice and wine. Boulton, 2017

• Controlling Redox Potential during fermentations. Boulton 2016

• The effects of pH and copper on the formation of volatile sulfur compounds in Chardonnay and Shiraz wines post-bottling. Marlize Z. Bekker, 2016

• Myths and facts regarding the role of precursors in the formation of ‘reductive aroma’ compounds in wines post-bottling. Marlize Z. Bekker, 2016

• The role of trace metals in wine ‘reduction’. AWRI.
eglantine.chauffour@enartis.com

More webinars at http://www.enartis.com/us/focus-on
Website:  www.Enartis.com/US
Phone: (707)838-6312

THANK YOU FOR YOUR ATTENTION!