STABILIZATION OPTIONS

For Sweet Wines before Bottling
Sugar-Sugar

• Top source of carbon
• Excellent seller of wine
• Brings balance to wine with high acidity/astringency
• Promotes peace, comfort and wellbeing...
• to all creatures great and small.
• Including yeast and bacteria.
Game plan to stabilize/prevent refermentation in the bottle?

- Filtration
- $\text{SO}_2$
- Dissolved oxygen
- Sorbate
- Pasteurization
- Velcorin®
- Bottling conditions
Filtration

- **Absolute** 0.45 micron membrane.
- $10^7$/cm$^2$ or $10^9$/10” retention rating as well as 99.9%. Ask for the validation guide.
- Integrity testable.
- 30k-80k gallons per 30” throughput if your prefiltration is done properly.
- Cons: The bottling line between the filter and the filler can still be a source of contamination.
SO$_2$

- Potassium metabisulfite (KMBS)
- Excellent anti-microbial and anti-oxidant agent
- Molecular SO$_2$? 0.5mg/l (ppm) for red, 0.8mg/l (ppm) for white, up to 1.5mg/l for dessert.
- pH dependent
- Tablets, granules, liquid, powder
- Timing.
Winemaking calculators

molecular $SO_2$

Molecular sulphur dioxide is the most effective form involved in both the reduction of oxidation reactions and microbial activity in wine.

The recommended level of molecular $SO_2$ for red wines is 0.5 mg/L (ppm); for white wines is 0.8 mg/L (ppm); and for dessert wines is up to 1.5 mg/L (ppm). You can use this calculator to determine how much Free SO2 is required to protect your wine, based on its pH. Free $SO_2$ over 50 mg/L (ppm) can be tasted and detect in nose of the wine.

<table>
<thead>
<tr>
<th>Desired Molecular $SO_2$:</th>
<th>(0.5) mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH of the Wine:</td>
<td>(3.9)</td>
</tr>
<tr>
<td>Required Free $SO_2$:</td>
<td>(62.01) mg/L</td>
</tr>
</tbody>
</table>

Winemaking Calculations powered by VinoEnology.com.
Dissolved oxygen

• By itself not enough to deter refermentation but as part of a game plan, it makes SO$_2$ more effective.
• <0.5ppm O$_2$ at bottling.
• Scrub DO with high purity food grade N$_2$ through a sinter.
  No DO meter? Scrub with 5 times the volume of N2.
• What you get?
  Fresher wine, less chance of oxidative spoilage microbes getting going, more stable and effective SO$_2$ levels/adds, and should see less incidence of post packaging reduction if you maintain low levels of DO. Also less browning.
Sorbic Acid

- A. W. Van Hoffman was the first to isolate Sorbic acid from the berries of the mountain ash tree in the year 1859.
- Potassium Sorbate is the most soluble salt of Sorbic acid. Salt form is preferred due to solubility.
- In the United States, the TTB permits the use of sorbic acid and potassium sorbate to preserve wine. The maximum concentration of sorbic acid allowed in finished wine is 300 mg/L, (300 ppm).
- [https://www.extension.iastate.edu/wine/sorbic-acid](https://www.extension.iastate.edu/wine/sorbic-acid)
Potassium Sorbate in wine

- Inhibitory effect against yeast *
- Selectively inhibitory against some bacteria
- *Not inhibitory against *Zygosaccharomyces bailii* at 0.06% Sorbic acid in 10% glucose solution.
- If you use contaminated concentrate with Zygo in it, you will get refermentation even if you used the correct level of molecular SO₂.
- Max dose is 300ppm of Sorbic acid but the taste threshold is much lower at about 130ppm.
- Potassium Sorbate is not effective against *Lactobacillus* or *Acetobacter*. *Lactobacillus* can metabolize and produce geranium type off flavors from it.
- Addition of sorbic acid often results in the formation of ethyl sorbate, which is said to impart an unpleasant odor when present at a significant level.
- To prevent off-flavors from Potassium Sorbate metabolism, you have to make sure you have sufficient molecular SO₂ levels based on your pH.
Potassium Sorbate... S’more

- The higher the alcohol content of your wine, the better the solubility of Sorbic acid and the less Potassium Sorbate you need to add:

- A wine must be filtered/clarified to less than 100 cells/ml for Sorbate to be effective.

- The solubility of Potassium Sorbate is affected by temperature – don’t add to cold wine.

- Mix wine very well after a Sorbate addition.

- Potassium sorbate contains 73.97% sorbic acid.
Sorbate addition calculation

- Potassium sorbate contains 73.97% sorbic acid.
- Ppm = mg/l
  mg/l of Sorbic acid x 1.35 = mg/l of Potassium Sorbate.

<table>
<thead>
<tr>
<th>ppm of sorbic acid desired</th>
<th>Grams of Potassium Sorbate Required gm/gal</th>
<th>Grams of Potassium Sorbate Required gm/10 gal</th>
<th>Grams of Potassium Sorbate Required gm/100 gal</th>
<th>Grams of Potassium Sorbate Required gm/1000 gal</th>
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<tbody>
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</table>
Pasteurization

- Batch, tunnel, flash
- Cider
- Beer
- Juice & dairy
- Kosher Wine
- Best practice is to filter the product to at least submicron before pasteurization.
- Protein stable before.
- Possible change in structure/mouthfeel/balance.
- Packaging?
- Solubility changes.
Velcorin®

- Dimethyl Dicarbonate (DMDC)
- Beverage Sterilant
- Max dose is 16ml/hl or 200ppm.
- Breaks down into equal parts CO2 and Methanol.
- Freezes at 63F. Needs special dosing machine for application/atomizing.
- Not a preservative so you don’t need to put it on the label.
- Action is temperature sensitive. The colder the wine, the slower the reaction.
Velcorin is dosed with a specialized dosing machine

- Dosing Machine Features:
  - Flowmeter to register the flow of beverage to the filler bowl
  - Intricate spritzing nozzle
  - Temperature control system
  - Dosing chamber that holds two cases of 3 kg bottles
Velcorin has a unique operating principle

Wine

Cell interior

200 mg dimethyl dicarbonate (lipophile)

96 mg methanol

131 mg carbon dioxide

2 H₂O

2 CO₂

natural occurring substances

lipophilic cell membrane penetration

inactivated enzyme with carbo-methoxylated imidazole group

[pH : 2 - 4 (acidic)]

[pH : 7 (neutral)]

H₃C

O

O

O

CH₃

H₃C

O

O

H₂O

H₃C

OH

H₃C

O

O

2 CO₂
Microbial Effectiveness of Velcorin

• Most effective against yeast
  – Saccharomyces
  – Brettanomyces
  – Zygosaccharomyces
• Moderately effective against some bacteria
  – Acetobacter
  – Pseudomonas
  – Lactobacillus
• Least effective against mold
Velcorin Applications in Winemaking

- To help stabilize unfiltered premium wines:
  - as a substitute for membrane filtration
  - as an insurance against undesirable yeast like *Brettanomyces*
- To decrease the amount of SO$_2$ used in early-to-market wines
- To prevent re-fermentation in wines containing residual sugar
- Bulk Wine stabilization
Velcorin is NOT a Silver Bullet!

- Velcorin is not a band-aid for sloppy sanitation
- Bench-Top studies are REQUIRED!
Other tools:

- Bactiless
- No Brett Inside
- Lysozyme
Bottling Conditions

• The last frontier.
• Where do you bottle? Automatic bottling line? Next to ferm tank? Did you know yeast and bacteria float around in the air?
• Sanitation = cleaning followed by sanitizing
• Biofilm buildup? Sugar acts like a magnet.
• Periodic filler head inspection/rebuild.
• ATP swabs – Charm science or Hygiena
• Sterile filtering into a tank and then hand bottling, is not sterile bottling.
• Cleaning your bottling line:
BEFORE...
...AFTER
Thank you!

That's all Folks!