EXTENSION

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Volatile acidity in wine

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Volatile acidity (VA) is a wine fault primarily caused by acetic acid. This acid is produced by certain bacteria and can later react with ethanol in the wine to form ethyl acetate through a process called esterification. Volatile acidity, as it's commonly referred to, smells like nail-polish remover or vinegar, and once it becomes noticeable in wine, it is difficult to eliminate. Prevention is the best way to control VA.

Acetobacter and *Gluconobacter* are two of the primary acetic acid bacteria responsible for VA in wine. *Acetobacter* oxidizes ethanol into acetic acid while *Gluconobacter* converts glucose into acetic acid. *Gluconobacter* is naturally found in the vineyard and is more prevalent in damaged fruit. Since *gluconobacter* converts glucose into acetic acid, VA levels can be quite high at the time of crush. *Acetobacter*, on the other hand, is constantly lurking in the cellar and is more prevalent in dirty cellars. *Acetobacter* will begin producing acetic acid in wine in the presence of oxygen and ethanol.

Once acetic acid is present in wine, it can then undergo a chemical transformation called esterification. Esterification is the process of recombining an organic acid with an alcohol to form an ester and water. Ethyl acetate is the result of esterification and smells sharply like nail-polish remover. Once ethyl acetate is present in wine, the only way to remove it is by reverse osmosis.

All wines are made with some level of VA. Yeast will produce some levels of VA during fermentation and yeast strain selection can help mitigate VA production. The threshold for detecting VA aromatically usually begins around 0.6 grams per liter (g/L). Wines are in danger of spoiling when VA levels reach about 1.0 g/L.

Measuring VA

Since acetic acid and ethyl acetate are volatile acids, they can be captured by distillation to quantify the amounts present. Distillation is the action of separating VA from wine by boiling the wine and then capturing the vapor and condensing it back into a liquid. The captured liquid, called the distillate, is then titrated using a base, and phenolphthalein is used as a color indicator. The molarity of the base and amount used will determine the concentration of VA in grams per liter (g/L).

- A commonly used base for titrating is sodium hydroxide (NaOH) at a concentration of 0.01 molar (M). Multiplying the milliliters (mL) used of 0.01M NaOH by 0.06 will yield the amount of VA present in g/L.

Mitigating VA

The best way to mitigate VA is by preventing it from happening. Use the following tips to mitigate VA.

- Be aware of damaged fruit coming from the vineyard.
- Select low-producing VA yeast and make sure the juice/must is fermenting completely.
- Clean and sanitize all winemaking equipment before and after use.
- Power wash cellar floors and any black mold.
- Clean wine spills and tank valves.
- Keeping tanks and barrels completely full will help to eliminate oxygen which is a prerequisite for *acetobacter* growth.
- Using potassium metabisulfite will help prevent acetic acid bacteria growth.

Remedies for VA

Although the only way to eliminate VA is by using reverse osmosis, one way to lessen VA in wine is by sterile filtering and then blending the wine until the VA threshold is below aromatic detection. Sterile filtration will remove any *acetobacter* present, after which the high-VA wine can be blended into a larger volume of low-VA wine to dilute the higher VA wine. Be careful doing this, as blending high-VA wine with low-VA wine will sometimes still result in high-VA wine. Wine volumes, ratios and knowing the exact measurement of VA in each wine are the key factors.

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