

**WINE MADE EASY**

# Volatile Acidity in Wine

## What Is Volatile Acidity?

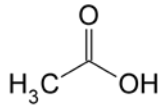
Volatile acidity (VA) is a measure of the wine's volatile (or gaseous) acids. The primary volatile acid in wine is acetic acid, which is also the primary acid associated with the smell and taste of vinegar.

## What Odors Are Affiliated with Volatile Acidity?

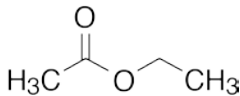
VA is affiliated with two different aroma compounds found in wine:

- **Acetic acid:**

smells like vinegar



- **Ethyl acetate:** smells like nail polish or some nail polish removers



While acetic acid concentration is a direct representation of a wine's VA, it is challenging for most people to smell until the VA has become a serious problem. Many people assume that they can smell and recognize the odor of acetic acid because they are familiar with the odor of vinegar. However, commercial vinegars have a concentration of 3 to 9 percent acetic acid (30 to 90 grams per liter, g/L), which is 30 to 90 times the allowable levels in wine.

Therefore, one key aroma that many winemakers can learn to associate with VA is ethyl acetate, which has a detection threshold between 100 and 120 milligrams per liter. While it is not necessary for high-VA wines (i.e., those wines with a high acetic acid concentration) to also have a high ethyl acetate concentration, both usually go hand in hand.



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## Did You Know?

Volatile acidity concentration is regulated by the federal Tax and Trade Bureau, and allowable levels for various wine styles can be found in the Code of Federal Regulations (CFR). In general, per the CFR: "The maximum volatile acidity, calculated as acetic acid and exclusive of sulfur dioxide, is 0.14 g/100 mL for red wine and 0.12 g/100 mL for white wines." This is equivalent to 1.4 and 1.2 g/L acetic acid for red and white wines, respectively.

Using sensory evaluation to identify the presence of ethyl acetate is a good indicator of potentially high-VA wines. However, the acetic acid concentration of a wine is measured analytically to confirm that a wine is within the appropriate legal limits of VA.

## Measuring Volatile Acidity

Wineries can measure the acetic acid concentration by using a cash still. While the nearly \$900 piece of glassware can look intimidating, it is often very easy to learn and maintain. A winery of any size can use it. VA should be measured, at minimum:

- After primary fermentation
- After malolactic fermentation
- Periodically through wine storage
- When a film is found on a specific wine
- Pre-bottling

Keeping an accurate record of the wine's volatile acidity can provide insight for winemakers troubleshooting a problem wine.

The outer chamber of a cash still is filled with distilled water, while the inner chamber contains the wine sample. As the wine is heated, volatiles will rise to the top of the inner chamber, condense and collect through the condenser unit. This condensation is collected and titrated using sodium hydroxide, followed by iodine to adjust for any sulfur dioxide interference from the wine. While the use of the cash still is simple, the analysis does involve the use of several hazardous chemicals. Wineries should take care in ensuring laboratory employee safety and proper disposal of hazardous materials.

For more formal laboratory protocols to determine the acetic acid concentration by cash still, please see:

- Enartis Vinquiry Technical Information protocols: [www.enartisvinquiry.com/index.cfm/pages/Technical%20Information/89](http://www.enartisvinquiry.com/index.cfm/pages/Technical%20Information/89)
- "Wine Analysis and Production" by Bruce W. Zoecklein et al. (ISBN: 0-8342-1701-5)
- "Chemical Analysis of Grapes and Wine: Techniques and Concepts" by Patrick Iland et al. (ISBN: 978-0-9581605-1-3)

## Volatile Acidity Development during Winemaking

VA is often associated with oxidation problems in a wine due to the fact that both result from overexposure to oxygen and/or a lack of sulfur dioxide management. Acetic acid bacteria require oxygen to grow and proliferate. Like many other microorganisms affiliated with wine production, acetic acid bacteria can be managed with proper sulfur dioxide treatments, adequate temperature control, thorough sanitation practices, and appropriate oxygen management strategies depending on the wine style. Reducing oxygen is a good way to minimize acetic acid management growth due to the bacteria's dependence on oxygen.

## Did You Know?

In 1857, Louis Pasteur set out to determine what was causing beer and wine to spoil. Acetic acid bacteria were the microorganisms that Pasteur eventually identified as the spoilage culprit!

Several winemaking practices can increase the risk of acetic acid bacteria contamination and proliferation:

- Cold soaking
- Natural or native fermentations
- Stuck or sluggish fermentations
- Barrel aging
- Prolonged headspace exposure in tank or barrel
- Post-bottling, especially when wines are not properly treated with sulfur dioxide or sterile filtered

## Remediating Volatile Acidity in Wine

This wine defect is much easier to prevent than remediate.

In lower-VA wines (less than 0.7 g/L acetic acid), winemakers can blend with a noncontaminated and lower-VA wine. Ensure that the high-VA wine is sterile filtered before blending.

In higher-VA wines (greater than or equal to 0.7 g/L acetic acid), winemakers can use reverse osmosis (RO) to lower the acetic acid concentration. Following RO, the wine can be blended with an uncontaminated and lower-VA wine. The wine that underwent RO should be sterile filtered before blending.

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