A 360 degree View of Malolactic Fermentation

From Answers.com fermentation is defined as follows:

1. The anaerobic conversion of sugar to carbon dioxide and alcohol by yeast.
2. Any of a group of chemical reactions induced by living or nonliving ferments that split complex organic compounds into relatively simple substances.

Malolactic Fermentation, commonly referred to as MLF, is the conversion of malic acid into 2 parts lactic acid and 1 part CO2. Bacteria, commonly referred to as Malolactic Bacteria are responsible for this conversion and do so preferably in the absence of Oxygen.

MLF also results in the breakdown of Citric acid to Acetic acid, an undesirable outcome. For most MLF, certainly natural and even cultured this is an understood consequence and mitigated by limiting available Citric acid for conversion. It is also another reason why the use of acid blends – especially those high in Citric acid should be avoided.

Given the right conditions, which we will examine later, any wine can enter into what is referred to as spontaneous MLF. It happens silently, as opposed to the aggressive conversion of sugar to alcohol by wine yeast, is often unintentional, and can easily be overlooked until such a time when the winemaker notices his wine has once again begun to bubble. A spontaneous MLF might be a good thing if all wines could benefit from MLF. Unfortunately, that is not the case. The true reason for a winemaker to employ MLF is to reduce acid by a natural method. That makes the #1 factor influencing the decision having a wine with an acid level that could benefit from reduction. Choosing the MLF approach to acid reduction is tied to the winemaker's understanding that the result of the acid reduction may include a softening of the wine, color changes, and flavor changes. A "buttery" Chardonnay or "velvety" Red may have undergone MLF to produce the perceptual results one encounters. These same perceptual changes – especially the unique flavor changes - would not be achieved by other means of acid reduction.

The Choice to Use MLF

The choice to use MLF on a wine should ideally begin before Primary Fermentation. It starts with yeast strain selection. The yeast we are referring to is the one to be used for the Primary Fermentation. Simply put, some yeast strains used for alcoholic fermentation combine better with Malolactic bacteria. Yeasts that produce excessive SO2 or that consume excessive amounts of nutrients might leave the wine medium in a state not suitable for a successful MLF. Nutrient management is something of concern not only for MLF, but also alcoholic fermentation. A good practice is to employ the use of yeast nutrient during the fermentation process. Any strategy to prevent MLF should not use nutrient depletion as it may result in an unintended "stuck" primary fermentation.

Malolactic Bacteria Commercial Strain vs. Au Natural

The same principal that applies to yeast selection applies to the decision for using a Malolactic culture. By isolating bacteria with predictable outcomes, a winemaker can increase his or her control over the winemaking process and improve his or her chances for repeatability. Furthermore, some bacteria strains have truly nasty effects on wine including the production of acetic acid.

Taking Control – One Way or Another

If you decide to proceed with an intentional MLF, most sources recommend inoculation at a point during primary fermentation where the alcoholic fermentation is vigorous, the total alcohol level is still low, the wine is yet unclarified, and the must temperature has been elevated. Low SO2 levels are also preferable.

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A list of conditions ideal for MLF:

1. pH – should be lower than ideal as MLF will result in an upward shift in pH. Reds should be in the area of 3.3 and whites in the area of 3.1
2. Acidity – acidity should be higher than desired, as MLF will reduce acid – specifically malic
3. Temperature between 68 and 86 degrees Fahrenheit
4. Lower alcohol
5. Unclarified wine
6. Low SO2 levels

Referring back to the point of inoculation, in the midst of the primary fermentation is ideal because it supports items 3 – 6. In particular, for #6 by inoculating during the primary, a low level of SO2 is offset by the production of CO2 from first the alcoholic fermentation and then later by the MLF.

A decision to avoid MLF may also start prior to fermentation in the selection of the yeast, but does not necessarily need to happen then. Using a MLF friendly yeast culture will provide options for the winemaker down the road when he or she may wish to employ MLF on only a portion of his or her wine.

Prevention of MLF essentially equates to good wine stabilization practices that include the following:

1. Maintaining SO2 levels suitable for inhibiting MLF. See *Sulfite – So what's the Story on the Most Widely Used Wine Additive?*
2. Regular racking of wine to separate from sediment and promote clarification
3. Maintain appropriate alcohol, acid, and pH levels
4. Maintaining a cellar temperature under 68 degrees, ideally 55 degrees.

Employing MLF in Wines with Very Low pH

When a wine has a pH in the area of 3.0 or lower, a winemaker will be challenged in attempting a successful MLF. In this scenario, if the winemaker is still looking to achieve some of the perceptual effects of MLF, he or she should first consider deacidification through another means that will bring the wine's pH upward and into a suitable range for employing MLF. See article titled *"Home Winemaker's Guide To The De-acidification of Must and Wine".*

Methods for Testing for MLF and its Completion

Perhaps the most well-known method for testing the progress of MLF is called the Paper Chromatography method. The name alone strikes fear into the hearts of many would-be malolactic fermenters. So, for the purposes of this article and its intended audience, we will examine another method that I feel is much more user friendly and yields immediate results.

The method I am referring to is the Malic Acid Test by Accuvin, LLC. Please note that the full product documentation can be found in related article Musto Accuvin Malic Test. The AV-Malic Acid test is intended for measuring the Malic Acid level of wine that is undergoing or has undergone malolactic fermentation. With diluted samples, it may also be used for testing grape juice and must. Although the documentation gives a more technical explanation, this test is essentially an indicator test whereby a sample is applied to a test strip, a reaction occurs, and the resultant color is matched against a chart. The matching color will tell the winemaker if the wine is still undergoing MLF or if the process has finished. It is essentially that simple.

In Summary

Malolactic fermentation is something to not fear, but rather understand. Understanding that not all wines are suited to undergo MLF, how to support or prevent MLF, and the perceptual influences that MLF has over wine will only make for a better winemaker.

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