

MALOLACTIC FERMENTATION

Q: What is Malolactic Fermentation, and how do I use it?

A: Malolactic Fermentation (MLF) is quite different from the typical primary fermentation, in which yeast convert sugar into alcohol. MLF involves bacteria instead of yeast, and it usually begins when primary fermentation is complete (~0° Brix)

MLF is conducted by *Leuconostoc*, and *Pediococcus* bacteria cultures. These bacteria convert malic acid, which is naturally present in fruits like grapes and apples, to lactic acid, which reduces the acidity of the must and improves the flavor of your wine. After MLF, the wine's flavor profile is smoother, and more complex. MLF can occur spontaneously, but it's best to conduct it yourself.

MLF is generally used for dry red wines but it can also enhance some dry white wines, such as Chardonnay, Sauvignon Blanc and Pinot Gris. MLF is not recommended for sweeter wines, like Riesling, Gewürztraminer and Muscat.

Malolactic bacteria are finicky about their conditions. They aren't tolerant of:

1. High alcohol (ethanol) (>14%)
2. High sulfur dioxide (<10ppm free SO₂, or <30 ppm bound SO₂)
3. Low temperatures (below 64°F). Many commercial winemakers want to get MLF finished before wintertime, when the storage cellar tends to get pretty cool – best when 64-68°F
4. Low pH (<3.2). High-acid grapes make it difficult to cultivate malolactic bacteria; in general, it will work in red wines with a pH of 3.3 or higher and in whites with a pH of 3.1 or above.
5. High oxygen levels. Excessive stirring can oxidize the bacteria.

The most-accepted rule of thumb is to wait until the end of primary fermentation before adding the culture. Because if malolactic bacteria ferment in the presence of sugar and most of the nutrients have been used up by yeast, the bacteria could degrade the sugar and create volatile acidity. Malolactic activity can be detected by the presence of tiny carbon-dioxide bubbles. When the bubbles stop, MLF is complete. This should take one to three months.

Malolactic bacteria will cause a pH shift. When you test your pH you will be looking at a number of around 3.1 to 3.4. At the completion of MLF you will see that the pH has shifted upwards - the wine has become less acidic. A pH of 3.6 (Cornell University says 3.4) is considered to be an upper limit that we do not want to exceed; higher than that, and you have to handle the wine with care.

Microbial stability is the number one reason to conduct MLF. Without it, unfiltered wine will try to go through the process itself, after it is bottled. When this happens, strains of bacteria can transform the wine's residual sugars into lactic acid, acetic acid and other byproducts. This will cause the wine to be turbid and slightly bubbly, with off-flavors and aromas. That's the tricky thing about MLF. It doesn't happen when you want it to, and then it does happen when you don't want it!

It's best to check to make sure all the malic acid gets converted. You can easily buy kits for this. It's a very simple test. Once you confirm that the conversion is complete, rack the wine and add some sulfite. Remember, MLF bacteria don't like sulfite, so don't add it until MLF is complete. Then let your wine age. MLF can be monitored with paper chromatography that tracks the appearance of lactic acid and the disappearance of malic acid. The carbon dioxide bubbles given off as part of the breakdown can be used as a less accurate indicator of an ongoing malolactic fermentation.

MLF is NOT recommended for wine kits (concentrates & juices) as they contain a high proportion of malic acid than grapes (or fresh fruit) - a result of the different processes they go through. If MLF were to occur, the high proportion of malic acid would be converted to lactic resulting in a wine with little acid and a pH above 3.8. Leaving it weak (flat), soft, and vulnerable to bacterial infections.