

WINES&VINES

65 Mitchell Blvd., Ste. A, San Rafael, CA 94903 • (866) 453-9701 • www.winesandvines.com

Troubleshooting Guide for Malolactic Fermentation Management

If the MLF build-up culture didn't start . . .

- Was the standard culture rehydrated in clean, warm (not hot) and chloride free water (20-30°C/68-86°F)?
- Was the juice or wine used to make the build-up culture at room temperature (22-25°C/72-77°F)? Temperatures below 18°C /64°F will considerably slow down ML growth.
- At the time of addition, was the temperature between the build-up culture and the wine no more than 6°C/10°F apart?
- Was the SO₂ level of the juice or wine used to make the build-up culture above 20 ppm total or 10 ppm free? High SO₂ levels in the build-up solution can be toxic to the culture.
- Was the pH of the juice or wine used to make the build-up culture above 3.2? If not, use potassium carbonate to increase the pH.
- Be aware that pesticide residues in juice used for build-up cultures will inhibit MLF.
- For best results, use pasteurized juice or wine for the build-up culture. If only non-pasteurized juice is available, then the build-up culture should have a "ML friendly" yeast (D254, GRE, RC212, etc.) added to protect against spoilage bacterial growth.
- Was D-malic acid added to adjust the pH? *Oenococcus oeni* cannot degrade D-malic acid! Be sure to only use L-malic acid.

The best way to determine the health of a ML build-up culture is to look under a microscope for abundant chains of *Oenococcus oeni* cells when the culture has converted ½ to 2/3 of the malic acid. Look for short chains 2-4 cells in length and about 10-20 units per view. Old cultures at the end of the growth cycle or at the end of alcoholic fermentation (stationary cultures) will appear in long chains (5 to 15 cells in length).

If the MLF did not start or complete . . .

- Did you start with a healthy build-up culture? The optimum time to add the culture to the wine is when it is ½ or 2/3 through malic conversion.
- Did you select a culture suited for the pH, alcohol and temperature of the wine? See the Table below.
- Do you practice simultaneous inoculation? Some yeast strains are more compatible than others with ML bacteria when it comes to competing for nutrients. Some yeast also produce inhibitors that can have a negative impact on growth and performance of ML bacteria.
- Is the wine low in nutrients? The addition of amino acids, vitamins, and minor growth factors to nutrient deficient wine may help stimulate ML activity. Care must be taken, however, to be sure that the added nutrients are not helping an undesirable renegade population of lactic acid bacteria take off!
- Did you expand the culture beyond the manufacturer's recommendation? More than a two-fold expansion can cause major dilution of the culture. Inoculation levels below 10° will delay the onset of MLF and cause slow (or incomplete) fermentations.

- Is the wine infected with high levels of *Lactobacillus* or *Pediococcus*? Consider using Lysozyme to help control these spoilage organisms. The time period between Lysozyme addition and malolactic starter culture inoculation should be long enough to guarantee a good MLF.

If there are bacterial off-flavors or spoilage issues . . .

- Especially in high pH wines, if allowed to go uncontrolled, *Acetobacter* or heterofermentative lactic bacteria like *Lactobacillus* can produce high levels of VA.
- Avoid acidification by citric acid in combination with MLF since it creates an environment favorable to high acetic acid formation.
- Using a selected malolactic starter cultures such as MT01 can control excessive diacetyl production.
- Spontaneous MLF by *Pediococcus*, *Lactobacillus*, and some wild strains of *Oenococcus* can produce strong off-flavors and sliminess in wine, especially in high pH and low SO₂ conditions. In high pH conditions, SO₂ is not very effective at controlling these renegade bacteria. Lysozyme is very effective at high pHs and offers another alternative to controlling unwanted lactic populations.
- Excessive masking of fruit character can be avoided by selecting the appropriate ML culture.

To avoid oxidation and protect against spoilage, top tanks or barrels immediately after MLF is complete and protect with SO₂ and/or Lysozyme.

Wine Parameters	Very Difficult MLF Conditions	Difficult MLF Conditions	Favorable MLF Conditions
Temperature	10-12°C (50-54°F)	12-18°C (54-64°F)	>18°C (64°F)
PH	2.9-3.2	3.2-3.4	>3.4
Alcohol % (v/v)	15-16	13-15	<13
Free SO ₂	12-20 ppm	5-12 ppm	<5 ppm
Total SO ₂	50-60 ppm	30-50 ppm	<25 ppm
Recommended Type of Malolactic Bacteria Starter Culture	Standard build-up	Standard build-up or a more tolerant Direct Inoculation	Standard build-up or Direct Inoculation