



CHR HANSEN

Managing 'Stuck' Malolactic Fermentations with Viniflora®

1. Introduction

Stuck Malolactic fermentation (MLF), where MLF stops partway through or never starts at all, is a problem any winemaker could do without. Stuck MLF can be caused by various reasons, some of these are related to winemaking practices or the MLF procedure followed, while others are simply down to the composition of the grapes, must or wine in question.

1.1 Effects of winemaking parameters

Winemaking parameters that can affect MLF performance include wine temperature, acidity/pH and sulfur dioxide (SO₂) levels of the wine. It is essential that the MLF system employed is suited to these physiological parameters, and that the wine is kept within the recommended ranges for these. A wine outside the correct parameters will result in an impaired MLF. The use of lysozyme, while very useful in controlling indigenous bacteria such as *Lactobacilli* and *Pediococci*, will also inhibit *Oenococcus oeni*, the organism that is generally used to complete MLF. Therefore, there should be a period of at least seven days after the addition of lysozyme, before MLF is initiated, to allow the activity of the enzyme to subside.

1.2 MLF procedure used

The MLF procedure used will have a large effect on its performance. Traditionally wine was put through a spontaneous MLF by allowing the population of indigenous bacteria to increase until >10⁶ cfu/mL, at which point MLF becomes most effective. Although this method is still employed in many regions, it offers the least control over the process and carries a high risk of spoilage/contamination by undesirable microbes. In contrast, Viniflora® direct inoculation cultures are added directly to wine or must (if co-inoculating during alcoholic fermentation) giving the optimum number of adapted cells of *Oenococcus oeni*, ready to start MLF immediately, therefore saving time. This method is the most robust and reliable, to help prevent a stuck MLF from occurring in the first place. Other MLF cultures are also available which do require pre-treatment or preparation. These potentially carry some of the risks of the spontaneous method and, compared to direct inoculation, are more labour intensive and often result in a slower MLF.

1.3 Composition of the grapes/must/wine

The composition of the grapes, and ultimately the wine produced, will also have an effect on MLF. High sugar and alcohol levels will inhibit many bacterial strains so it is essential for these wines to use a suitable culture such as Viniflora® CH16, which can carry out MLF in wines up to and, in some cases, over 16% v/v. MLF can also be more difficult to start in wines with low malic acid levels. Metabolites derived from the grapes including various amino acids and vitamins are essential for the sustainability of the bacteria performing a MLF. This is one of the reasons why co-inoculation, or MLF together with yeast, is often the best method for a faster overall MLF. A nutrient source such as Bactiv-aid can also be used to ensure enough nutrients are present. This is particularly suggested if MLF is to be delayed for some months, or is to be carried out on wine after it is racked off its yeast lees.

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2. Treating a stuck MLF

It is essential to have a robust and effective method for treating a stuck MLF, as a wine which has not completed this process will generally have low SO₂ levels and is thus at risk of oxidation or spoilage, and ultimately a loss of quality. For the vast majority of wines, it is paramount to have MLF completed efficiently and effectively so microbial stabilisation can take place early, with the subsequent wine then ready for the next stages in the winemaking process. In the case of 'quick to market' wines, this means finishing and bottling can take place as soon as possible. There are three methods that are suggested for treating a stuck ferment. The first two, which are based on re-inoculation, are often the most suitable due to their simplicity. The third and most traditional method is Adaptation. Before any of these procedures are employed, it is essential to ensure that there is compatibility between the culture to be used and the stuck wine's parameters for alcohol, temperature, pH and total SO₂ levels. If one or more of these parameters is exceeded in the stuck wine, then this is most likely the cause of the stuck ferment. In such cases, other interventions will be necessary to adjust the physiological parameters for treatment of the wine to be effective. Please see Appendix I for a list these parameters for the Viniflora® direct inoculation range.

2.1 Re-inoculation with one direct inoculation starter

Direct inoculation with a suitable Viniflora® culture along with the use of Bactiv-aid is the most straightforward and fast way to re-start a stuck ferment. While this procedure works very well on the vast majority of stuck MLF's, it works particularly well when a spontaneous MLF has been initially employed.

1. Select a suitable starter culture for the stuck wine's parameters (alcohol, temperature, pH and total SO₂), see Appendix I
2. Ensure the stuck wine is at 18-22°C
3. Add double the recommended amount of culture to the stuck wine (i.e. for 12,500L add 1 x 25,000L bag)
4. Add Bactiv-aid to the stuck wine at the recommended rate (1 bag per 2,500L or 1 bag per 25,000L depending on which size)
5. Ensure wine and culture are well mixed

2.2 Re-inoculation with two direct inoculation starters

In some rare cases antagonism between different microbial strains and species (including yeast) can be the cause of a stuck MLF. To account for this phenomenon, this procedure is similar to the method above, however uses two suitable starter cultures, each at the initial recommended rate. This is likely to be the most suitable method if a direct inoculation starter was initially used for the MLF, within its physiological parameters.

1. Select two suitable starter cultures for the stuck wine's parameters (alcohol, temperature, pH and total SO₂), see Appendix I
2. Ensure the stuck wine is at 18-22°C
3. Add the recommended amount of culture, for each starter, to the stuck wine (i.e. for 25,000L add 1 x 25,000L bag for each starter)
4. Add Bactiv-aid to the stuck wine at the recommended rate (1 bag per 2,500L or 1 bag per 25,000L depending on which size)
5. Ensure wine and culture are well mixed

2.3 Adaptation

Adaptation involves inoculating a suitable starter culture to some 'other' wine (that has not undergone MLF, therefore not the stuck wine) along with a nutrient source. The stuck wine is then slowly added to the inoculated mixture. While time consuming, this method is the most traditional method for treating a stuck MLF. The starter culture used should be compatible with the stuck wine parameters (see Appendix I) and the 'other' wine used should have a pH ~3.5, temperature of 18-22°C, total SO₂ < 30mg/L, and alcohol < 14%. The stuck wine is re-introduced to the inoculation mixture at a rate of 1:1, every few days.

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Appendix I

Viniflora® direct inoculation MLF cultures - physiological parameters

	Wine	MLF flavors	Temp.	Alcohol	pH	Total SO ₂	
Viniflora® Oenos	RED ROSÉ, WHITE	YES	17-25°C	14 % v/v	3.2	40 ppm	for most wines
Viniflora® CH16	RED ROSÉ	YES	17-25°C	16 % v/v	3.4	40 ppm	for high alcohol wines
Viniflora® CH11	WHITE ROSÉ	YES	14-25°C	14 % v/v	3.0	35 ppm	for low pH wines
Viniflora® CH35	WHITE ROSÉ	YES	15-25°C	15 % v/v	3.1	45 ppm	for high SO ₂ wines
Viniflora® CiNé	RED ROSÉ, WHITE	NO	17-25°C	14 % v/v	3.2	30 ppm	for most wines

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