



Co-inoculation as a winemaking tool for successful MLF



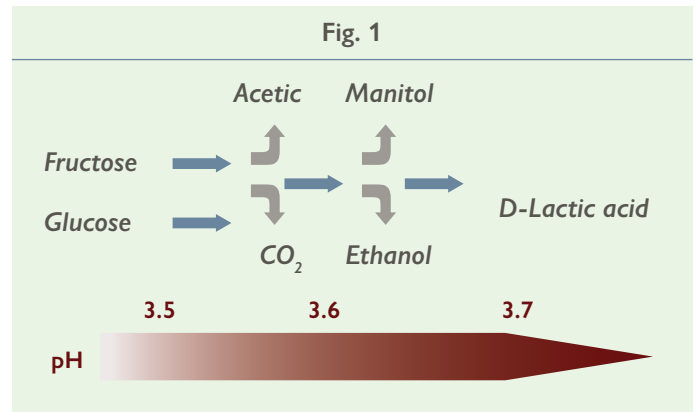
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General Application MLF Starter Culture

The use of Malo-Lactic Fermentation (MLF) starter cultures has become a standard application for quality winemaking in all winemaking countries. Most of the MLF starter cultures in use reliably convert the malic acid into lactic acid. Besides this well-known conversion, the MLF also has a significant impact on the sensory profile of the wine. The focus for winemakers and the producers alike, is to have MLF cultures that are reliable and easy to manage under varying wine conditions, and that have a favourable impact on the sensory profile. Besides the physiological properties of the MLF starter culture, the timing of the inoculation is another important factor to consider in order to gain maximum reliability for the MLF and to also manage the flavour development of the wine.

Sugar Metabolism of the MLF Starter Culture

The most commonly recommended application for the inoculation of the MLF starter culture is in the post alcoholic fermentation stage i.e. the MLF starter culture will be added after the sugar is completely fermented. There is a historic backing for this timing. In older literature, it was widely mentioned that all lactic acid bacteria, including *Oenococcus oeni*, would degrade sugar to acetic acid and other undesired by products. This statement stopped the winemaker from inoculating earlier than the post alcoholic fermentation stage.



Timing of Inoculation

Research in recent years has shown that an earlier timing for the inoculation in the presence of sugars, does not lead to an increase of acetic acid and other undesired by-products. In contrast to the old literature, various field studies and lab experiments have shown that selected MLF starter cultures will not produce higher acetic acid levels when earlier inoculation has taken place in the presence of sugar (2000; Petersen, Nygaard, Aaaling, Heinemeyer). It could be shown that the sugar metabolism of *Oenococcus oeni* is monitored by the present pH of the wine. Below pH 3.6 the sugar uptake is limited as malic acid is the main energy source and is easier to utilise for *Oenococcus oeni*. Above pH 3.6 the bacteria start to shift more into the sugar metabolism causing the risk of VA formation.

Co-inoculation

There are special situations during the vinification where an earlier inoculation can help MLF starter cultures to overcome inhibitory conditions, such as high potential alcohol, low pH or the risk of low cellar temperatures after the primary ferment. It is under these conditions where a simultaneous or co-inoculation is recommended. The co-inoculation of the MLF starter culture should be made at ~4.3 Baumé / ~8°Brix as the wine conditions at this stage are the most favourable for the survival of *Oenococcus oeni*. The SO₂ formation coming from the yeast metabolism is at the lowest and the MLF cultures have less competition with the fully developed yeast population. To realise the full benefits of a simultaneous inoculation, it is essential that the pH of the wine is carefully checked and is below pH 3.6.

MLF Starter Cultures

The MaloBacti range of MLF starter cultures CN1, HF2 and AF3 work perfectly with a simultaneous inoculation due to their new adaptation technology. The new adaptation and acclimatisation procedure ensures the bacteria are alive and well adapted to the wine conditions upon inoculation. They will start immediately with the malic acid degradation.

SITUATION	Recommended MLF Starter Culture	Co-inoculation
Low temperature in post fermentation stage High potential alcohol > 14.5% Low pH < 3.1	MaloBacti™ HF2 MaloBacti™ HF2 or AF3 MaloBacti™ HF2	at 4.3 Baumé / 8 Brix and pH < 3.6

