

ENARTIS NEWS

MALOLACTIC FERMENTATION SCENARIOS: WHEN TO PROMOTE, DELAY OR PREVENT IT

Depending on the desired wine style, we may want to promote, prevent or delay malolactic fermentation (MLF). Here are some practical tips on how to handle these different situations.

PREVENT MLF

For young, fresh, easy-to-drink style wines MLF may not be desired. Lactic acid bacteria activity is generally controlled by using SO₂ but in many situations, especially in the case of high pH wines, its addition is not always enough, and spontaneous fermentation can occur. In the case of SO₂-free or low-SO₂ wines, like base wines for sparkling production for example, the risk of an unwanted malolactic fermentation onset is obviously even higher. In critical conditions, 10-20 g/hL of an activated chitosan-based product like EnartisStab MICRO M (Figure 1) can be used to reinforce SO₂ antibacterial activity and reduce the number of bacteria below the risk threshold thus preserving wine acidity.

EnartisStab MICRO M can be added to wine and is allowed to stay in contact for a couple of days and then racked or filtered off. This way of operating is recommended when wine need to be clarified, knowing that once chitosan is removed, wine is unprotected from new potential contamination.

Alternatively, EnartisStab MICRO M can remain in contact with wine and be periodically resuspended to reactivate its antimicrobial protective effect in the full wine volume. This way of operating is highly recommended especially in the case of SO₂-free or low-SO₂ wines.

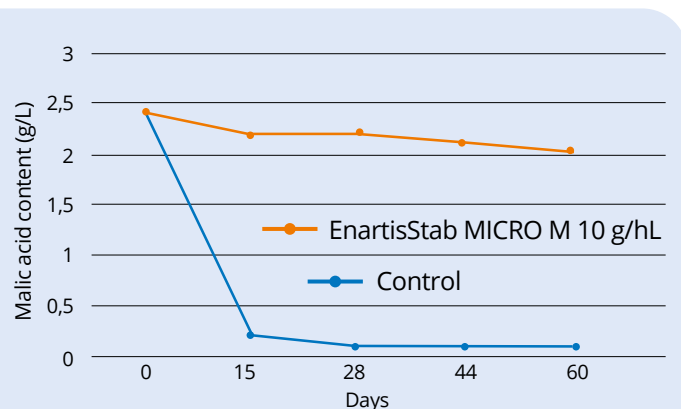


Figure 1: EnartisStab MICRO M inhibiting effect on MLF. The graph shows the variation of malic acid concentration over time in a control wine versus wine treated with EnartisStab MICRO M.

Table 1: Main features of the oenological tools for controlling Lactic acid bacteria.

	ACTIVATED CHITOSAN	LYSOZYME	SO ₂
ORIGIN	<i>Aspergillus niger</i>	Egg albumen	Sulfur
ALLERGENIC		✓	✓
Suitable for VEGETARIANS	✓	✓	✓
Suitable for VEGANS	✓		✓
Effective against LACTIC BACTERIA	✓	✓	✓
Effective against ACETIC BACTERIA	✓		✓
Effective against BRETTANOMYCES	✓		✓
EFFECTIVENESS AT HIGH pH	Good	Good	Limited
Side effects POSITIVE	<ul style="list-style-type: none"> • Antioxidant (removes Cu and Fe) • Minimize laccase activity • Improve wine clarity • Remove sulphur off-roma 		Antioxidant
Side effects NEGATIVE		Strips colour	<ul style="list-style-type: none"> • Discoloration • Interferes with the colour stability process

DELAY MLF

Most red wines go through MLF and for the majority of winemakers, the sooner it happens, the better. Actually, the time frame between the alcoholic fermentation (AF) and MLF is the best stage to apply macro-oxygenation to encourage anthocyanin-tannin polymerization via acetaldehyde bridge formation. Having a 5-10 days interval offers the opportunity to effectively improve wine colour stability due to the fact that in this period the following factors converge:

- Wine temperature is relatively high and promotes fast reactions.
- Free anthocyanin and grape tannin concentration is at a maximum.
- SO₂ content is close to zero and cannot hinder ethanol oxidation or bind with acetaldehyde and anthocyanins, thus inhibiting polymerization and condensation reactions.

Oxygen added in a relatively high quantity per day (hence the term “macro-oxygenation”) induces the oxidation of ethanol into acetaldehyde. This compound acts as a bridge in polymerization reactions involving tannins and anthocyanins, creating stable colour compounds that contribute to a deep mauve colour and a soft tannin structure. The addition of tannins specifically designed for this application like EnartisTan E (grape seed extract rich in monocatechins) or EnartisTan MICROFRUIT (blend of oak tannin and condensed tannins extracted from grape seed and wood of red fruit trees) amplifies the effect of the macro-oxygenation increasing the fraction of anthocyanins converted to more stable compounds (Figure 2). Consequently, wine will not only keep a more intense and fresher colour, a characteristic especially desired in varieties naturally poor in colour like Pinot Noir, Sangiovese and Nebbiolo, but it will also have a fuller and softer body due to the contribution of this greater content of pigments.

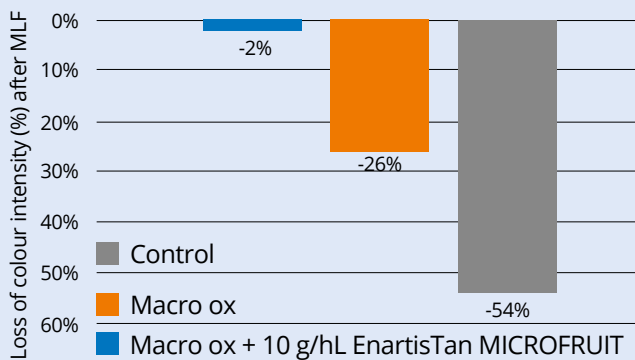


Figure 2: Macro-oxygenation plus tannin addition reduces the loss of colour caused by MLF.

Naturally, dealing with one or two weeks with a microbiological unprotected warm wine can create some anxiety. This is when activated chitosan can help the winemaker to reach the goal safely. The addition of 10 g/hL of EnartisStab MICRO M towards the end of AF, when there are still 10 -15 g/L residual sugar, or 5 g/hL right after the rack off, will delay the onset of MLF and support macro-oxygenation treatment without interfering with the colour stabilization process whilst controlling lactic acid bacteria, acetic acid bacteria and Brett at the same time. Once macro-oxygenation is completed, removing EnartisStab MICRO M with a rack off is enough to recreate the favourable condition for the onset of MLF with selected bacteria inoculation.

PROMOTE MLF

Due to the tendency of wine's pH to increase and reducing the use of sulfur dioxide, spontaneous MLF can easily occur. Actually, spontaneous MLF is a risk for wine and consumer health.

Controlling MLF with selected strains of *Oenococcus oeni* helps control the timing of malic acid degradation and ensures the production of healthy, high quality wine by preventing the production of biogenic amines and off-flavours by positively contributing aroma complexity.

It is well-known that the success of a controlled MLF depends on wine parameters (mainly ethanol content and pH), the choice of the most suitable strain and the correct handling of the product (Figure 3). Nevertheless, it may happen that

despite all wine parameters seeming to be correct and the choice of MLB strain correct, MLF may struggle to start. This is due to the presence of inhibiting factors in wine which are not easily detected. Residual copper or residual pesticides, low-molecular weight fatty acids and some proteinaceous compounds produced by yeast and high levels of polyphenols can alter bacteria cell membrane permeability or inhibit malolactic enzymatic activity and prevent MLF onset. Occasionally the lack of nutrients, namely nitrogen in organic form, is the main obstacle for MLF success. In these instances, the addition of a yeast derivative product such as Nutriferm ML helps to detoxify the environment absorbing the inhibiting factors and to provide amino acids for bacteria nutrition.

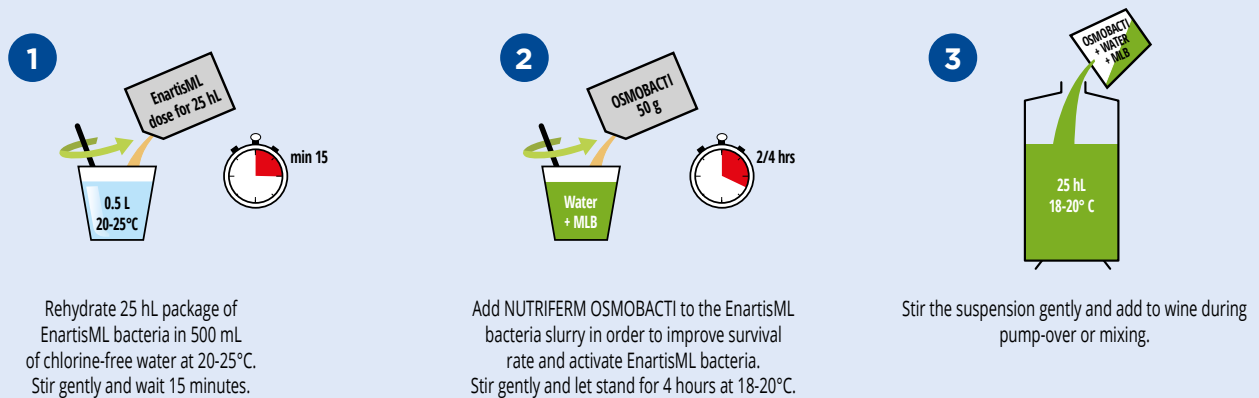


Figure 3: Protocol for malic acid bacteria preparation and inoculation.

PRINCIPAL FACTORS	EnartisML MCW	EnartisML SILVER	EnartisML UNO
SPECIES	<i>Oenococcus oeni</i>	<i>Oenococcus oeni</i>	<i>Oenococcus oeni</i>
pH TOLERANCE	>3.1	>3.1	>3.3
FREE SO ₂ RESISTANCE (mg/L)	<10	<10	<10
TOTAL SO ₂ RESISTANCE (mg/L)	<40	<45	<40
ALCOHOL TOLERANCE (% v/v)	>15	>15	<15
SPEED	Moderate/High	High	High
SENSORY	Clean, floral, fruity and complex aromas; respects colour; improves structure, volume and aromatic intensity.	Contributes to clean and fruity aroma and reduces vegetal notes, softness and enhances wine flavours.	Maintains colour intensity; respects varietal aroma and olfactory cleanliness.

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