

**CHAPTER ONE**

**Sparkling**



When pressing grapes for making sparkling wines the juice plays a very important part and winemakers can optimize its quality by dividing the different press-cuts and treating those separately.

The characteristics listed below change significantly as the must flows out of the press:

- Tartaric acid and pH (see evolution of pH in fig. 1);
- Ca++ and K+ cations, where these cations increase exponentially when getting in the 3rd press fraction and the hard press;
- Turbidity, with a linear increase proportional to the pressure applied;
- Polyphenols extraction (see TPI evolution in fig. 1);
- Oxidation of the juice, which becomes critical during the second press fraction, at the breaking point of the berry.

4,000 KG OF GRAPES (8,800 LBS)		CHAMPAGNE	GOOD	OPTIMAL
FREE-RUN		150 L	300 L	300 L
PRESS FRACTION 1	START	CUVÉE: 2,050 L	CUVÉE A: 1,600 L	FIRST CUVÉE: 400 L
	END			CUVÉE CORE: 600 L
PRESS FRACTION 2	START			FIRST CUVÉE: 200 L
	END			CUVÉE CORE: 400 L
PRESS FRACTION 3	START	HARD PRESS: 350 L	CUVÉE B: 400 L	FIRST CUVÉE: 50 L
	END			CUVÉE B: 350 L
PRESS FRACTION 4	START	HARD PRESS: 250 L	HARD PRESS: 250 L	HARD PRESS: 250 L
	END			

Chart 1: Example on press cuts management for sparkling wines

PRESS CUT	REVERVE	MILLÉSIME	EXTRA BRUT	BRUT	RESERVE WINE
CUVÉE CORE	100%	85%	60%		50%
FIRST CUVÉE			15%	50%	50%
CUVÉE B		15%	25%	20%	
HARD PRESS				25%	
FREE RUN				5%	

Chart2: Sparkling blends could be assembled using the different qualities of juice coming out of the press.

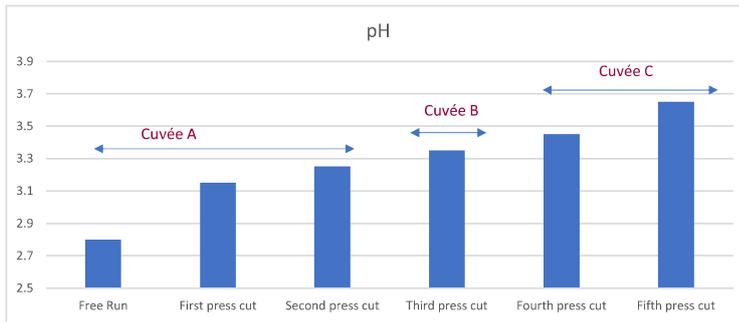


Fig. 1 Evolution of pH

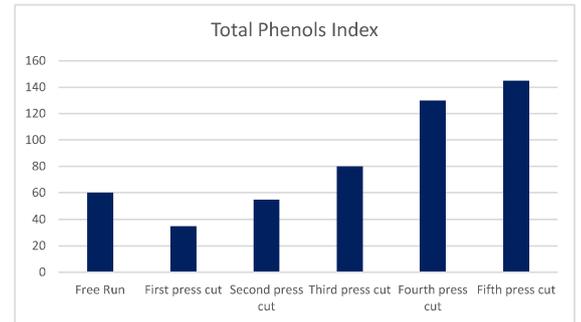


Fig. 2 Evolution of phenolics



## MUST FINING:

A good management of the must is crucial for obtaining a good bubbly wine. In fact, fine-tuning the different fractions of the juice properly will allow the winemaker to work with a base with several positive characteristics, including lower microbiological charge, lower risk of aromatic defects, less turbidity, protection from the oxidative and anti-fermentative activity caused by copper from the vineyard, lower load of oxidized or oxidable catechins, etc.

When clarifying the must, winemakers have substantially two choices:

### **Static Clarification:**

- Better respect of the wine structure
- Needs at least 8 hours
- High energy cost

### **Flotation with systems like E-Flot**

- Quick clarification
- Better for high turbidity juice
- Low energy cost

In both cases, it is preferable to depectinize the must with a quick enzyme which will also have a good activity at the low temperatures recommended when delivering grapes for base sparkling wines. To optimize this phase, AEB recommends **Endozym Ice**.



Fig. 3: E-flot 80

## **ACIDITY MANAGEMENT:**

Acidity is a crucial component of sparkling wines. For bubbly wines, we always want a low pH and a good balance of the three main organic acids:

**1. Tartaric acid:** is a “structuring acid,” the spine of the wine. Tartaric acid has a crucial influence on taste perception and wine stability. During winemaking, its concentration decreases. It is recommended to achieve tartaric stability in base wines, but we can further stabilize during the dosage with **Arabinol HC** and **New-Cel** (gum Arabic and Carboxymethylcellulose).

**2. Malic acid:** is the specific acid of maturation. In fact, its concentration decreases during ripening. It is largely responsible for the sensation of freshness in the end of the mouth, but it can turn into bitterness and greenness if its concentration is poorly controlled. Winemakers making sparkling wines need to know as early as possible if the wine will go through malolactic fermentation or not. If malolactic is not the preferred fermentation for sensory reasons, excessive Malic acid could be taken out with a non-saccharomyces (Schizosaccharomyces) like AEB’s Promalic, which is capable of metabolizing Malic acid into alcohol.

**3. Lactic acid:** its concentration depends on the microbiological strains of transformation of grapes into wine (yeast and bacteria). It is a weak acid with a significant taste influence in terms of “fat”. It is responsible for the feeling of freshness in the middle of the mouth, but it can generate exaggerated “creaminess” and “heaviness” when in excess.

- Addition of Lactic acid with non-saccharomyces yeast: the utilization of **Levulia Alcomeno** (Lachancea thermotolerans) in the primary fermentation can contribute to the formation of Lactic acid without depleting Malic acid. It will result in a pH decrease.

## **PH:**

Starting with a low pH is crucial to making a good sparkling wine. A low pH keeps a clean and fresh palate and protects from the challenges of evolution, including guaranteeing color stability, redox balance, a higher molecular SO<sub>2</sub> which, for example, is 6% active at pH 3,0 but just 3.9% active at pH 3.2.

Unfortunately, a low pH sometimes poses some challenges. For example, the combination with Carbonic acid can put stress on the pied de cuve and for this reason is recommended to de-gas or deacidify during this process.

Additionally, low pH values increase the positive charge of proteins, making them more unstable due to their strong affinity for the negatively charged phenolics. Fermenting on bentonite, like Bentogran or fining agents from the Microcel and Catalasi lines of products, reduces the need of protein stabilization down the line.

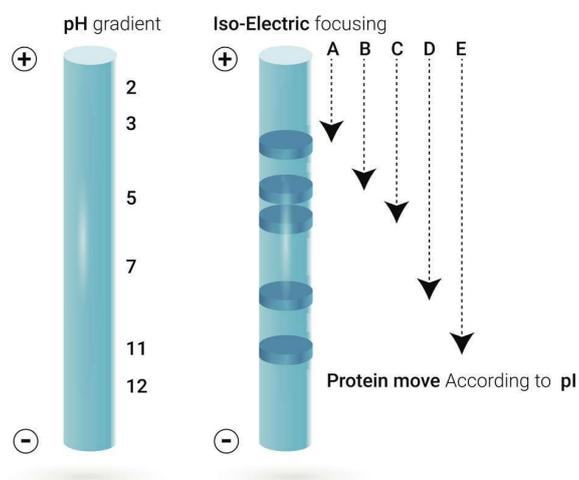


Fig. 4: the lower the pH the stronger the attraction for negative molecules (higher protein instability).

## **PH REDUCTION AND TARTARIC STABILITY WITH CATION EXCHANGE:**

### **Stabymatic**

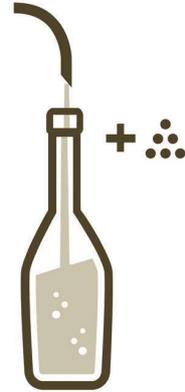
To reduce cations like  $K^+$  and  $Ca^{++}$  and stabilize for tartrates while at the same time reducing the pH, AEB has developed a system, suitable for musts, that can be utilized by both small and large wineries. Stabymatic is a line of ion exchange equipment that includes manual, semi-automatic, or fully automated units. With Stabymatic winemakers can lower the pH by .3 points. The principle of the machine is that the wine loses its potassium and, to a lesser extent, calcium in exchange for protons. The result of this exchange is tartaric stability and lower pH.



Fig.5: Semi-automatic Stabymatic

## **PHENOLIC PROFILE MANAGEMENT:**

Adding tannins (Tanisage) improves the redox buffer capacity of sparkling wines, thus preventing reductive deviations of yeast origin. Tannin addition always improves structure and complexity. In case of traditional methods, it also improves the elasticity of the bentonite/alginate deposit. Recommended tannins for this addition must be easy to solubilize like **Protan Raisin** (proanthocyanin from grape skin) or from the **Ellagitan Barrique Liquid line**.



### **Timing:**

- Classic method: mix directly with the wine with the dosage.
- Pressurized tank: add directly to wine before adding yeast.

Micro-oxygenation with **Microsafe**, along with tannins' addition, can also help the polymerization of bitter catechins and promote a smoother polyphenolic profile. If that is not possible and bitterness is a concern, the must needs to be fined with proteins-based products or PVPP, as shown in the table below.

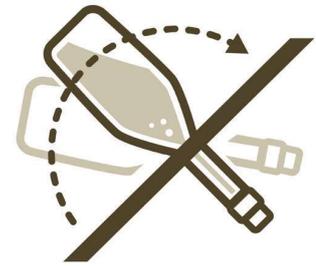
It must be kept in mind that it is always better to treat the juice rather than the wine. With the utilization of enological products, we can treat or better prevent eventual faults in the different press fractions.

	<b>FREE RUN</b>	<b>FIRST PRESS</b>	<b>SECOND PRESS</b>	<b>THIRD PRESS</b>
Preferred Clarification	Flotation	Cold Settling	Flotation/Cold Settling	Flotation
Proteins	Bentogran	Bentogran	Microcel Or Catalasi Line	Microcel or Catalasi line
Microorganism	Primaflora 50 Ppm	Primaflora 30 Ppm	Primaflora 40 Ppm	Primaflora 50 ppm
Polyphénols Fining	Catalasi Vega 300 Ppm	Microcel Af 200 Ppm	Catalasi Plus Af 300 Ppm	Quickgel AF 100 ppm
Pesticides And Color	Decoran Gran		Decoran Gran	Decoran Gran
Pectines	Endozym Ice			

Chart 3: Must fining recommendations

## **RIDDING (REMUAGE):**

The purpose of this stage is to combine the particles in suspension with the heavier sediment, which descends by stages towards the neck. This stage is critical for obtaining a perfectly clear wine and can be improved with the help of riddling agents like Adjuvant Cristal to be added in the pied de cuve.



## **PRISE DE MOUSSE**

### **The ideal base wine:**

- Alcohol shouldn't be higher than 11.5% (it will get to 13 during the prise de mousse).
- pH should be higher of 2.9 (free SO<sub>2</sub> will be too active at lower pH's).
- Base wine should be de-gassed.
- Set temperature between 57°F and 62°F/14°C and 17°C (classic method) or up to 68°F/20°C (pressurized tank), the higher the temperature the higher the biomass.
- The base wine needs to be stabilized for tartrates and proteins.
- The ideal base wine has a good complexity of aromatics. For this purpose we recommend nutrition of the yeast on aminoacids with products like **Fermoplus Floral, Tropical, Sauvignon, or Fermoplus Prosecco.**

### **The ideal starter:**

Preparing the yeast for the tirage is a crucial process because the cells need to adapt to difficult conditions (low pH, alcohol, SO<sub>2</sub>, etc.).

We recommend Fermoplus Energy Glu, a nutrient rich in amino acids specifically designed to boost the biomass. We also recommend to build a strong pied de cuve with our range of yeasts created for this purpose:

**Levulia Cristal:** yeast certified by Comité Interprofessionnel du Vin de Champagne;

**Levulia Probios:** organic certified strong Bayanus 

**Fermol Charmat:** strong Bayanus.

For nutrition in the prise de mousse, we recommend **Enovit Perlage**, a fully soluble DAP-based product.

## **FASTER TIRAGE: THE REACTIVATEUR**



Fig.6: Reactivateur

Traditionally, a good starter is made over the course of three days. Successful trials demonstrated that with AEB Reactivateur winemakers can rehydrate and inoculate into the tank in one day (<8h), instead of 3-4 day procedures. In a trial run in a California winery, increase of pressure inside the tank (0.5-0.8 bar), a signal of a strong start for the fermentation, was monitored in less than 24 h compared to the usual 48-72 h, and the target pressure of 5 bar was reached in 7 days instead of 18-21. Neither aromatic defects nor other significant changes in the chemistry of the wine were detected and filtration was successful, using crossflow equipment prior to bottling.

It is not possible to elaborate a “proper” Extra Brut if:

- The polyphenolic structure is not built for it (in this case we can use skin tannins like **Protan Raisin** to adjust).
- The aromatic structure is not good enough (we can boost aromatics with **Endozym Beta-split** and **Endozym Thiol**).
- The acid structure is not balanced (we can use **Stabymatic**).

### **Dosage:**

DENOMINATION	SUGAR LEVEL
Brut	Under 12 g/l
Demi-Sec	Up to 32 g/l
Extra Brut	< 5 g/l

Chart 4: The quantity of residual sugars must be the last touch to the cuvée.

ACTIVITY	IN THE MUST	IN THE WINE
Protect from oxidation of phenolics	Ferment on Microcel or Catalasi AF plus	Elevage Glu at the end of primary fermentation
Stabilize Tartaric	Stabymatic	Stabymatic or New-Cel at tirage
Add Lactic Acid	Levulia Alcomeno	
Deplete Malic without ML	Promalic	
Depectinize cold must	Endozym Ice	
Adjust phenolic structure	Protan Malbec/Pepin	Protan Raisin or Barrique liquid at tirage
Optimize aromatic complexity	Ferment on Fermoplus Prosecco or other varietals	Endozym Thiol and Beta Split

Chart 5: technologies for fine tuning

## **CHAPTER TWO**

# **Yeast**

*Fermol, the right yeast to create quality wine*

	TYPE	NAME	SPECIES	APPLICATIONS	ORIGIN
WHITES	FLORAL	FERMOL FLEUR	S. CEREVISIAE	VARIETAL AND AROMATIC WHITE WINES, ROSÉ WINES	MONTPELLIER, FRANCE
		FERMOL AROME PLUS	S. CEREVISIAE	WHITE AND ROSÉ WINES	REIMS, FRANCE
	VARIETAL	FERMOL LIME	S. CEREVISIAE	VARIETAL AND AROMATIC WHITE WINES, ROSÉ WINES	MONTPELLIER, FRANCE
		FERMOL SAUVIGNON	S. BAYANUS	AROMATIC WHITE GRAPE VARIETIES PARTICULARLY SAUVIGNON BLANC	SANCERRE, FRANCE
	TROPICAL	FERMOL TROPICAL	S. CEREVISIAE	VARIETAL AND AROMATIC WHITE WINES, ROSÉ WINES	MONTPELLIER, FRANCE
		FERMOL CHARDONNAY	S. CEREVISIAE	ELABORATION OF GREAT WHITE WINES	BURGUNDY, FRANCE
	MIXED	FERMOL BLANC	S. BAYANUS	WHITE WINES	TRENTINO, ITALY
		FERMOL 2	S. BAYANUS	WHITE WINES, SPARKLING	ITALY
SPARKLING		LEVULIA PROBIOS	S. BAYANUS	ORGANIC WINES: FRUITY DRY WHITE AND SPARKLING	CHAMPAGNE, FRANCE
		FERMOL CHARMAT	S. BAYANUS	VINIFICATION OF BASE WINE. SECONDARY FERMENTATION IN TANK OR BOTTLE	CHAMPAGNE, FRANCE
		LEVULIA CRISTAL	S. BAYANUS	SPARKLING WINE TRADITIONAL METHOD	CHAMPAGNE, FRANCE

KILLER FACTOR	LAG PHASE	FERMENTATION	VA↑	S02↑	GLYCEROL↑	MALIC↓	FOAM	AVERAGE YAN	ETHANOL TOLERANCE
POSITIVE	●●	●●●●	●●	●	●●●●	●	●●	●● 280 PPM	15%
POSITIVE	●	●●●●	●	●	●●	●	●	●●●● 340 PPM	14%
POSITIVE	●●	●●●●	●●	●	●●	●	●●	●● 280 PPM	15%
POSITIVE	●●	●●	●	●	●●	●	●●	●● 250 PPM	15%
POSITIVE	●●	●●●●	●●	●	●●	●	●●	●● 280 PPM	15%
NEUTRAL	●●	●●●●	●	●●	●●	●	●●	●● 245 PPM	15%
NEUTRAL	●	●●●●	●	●	●●	●●●●	●●	●● 250 PPM	16%
NEUTRAL	●	●●●●	●	●	●●	●●●●	●●	●● 250 PPM	16%
POSITIVE	●	●●●●	●	●	●●	●●	●	●● 250 PPM	16%
NEUTRAL	●●	●●●●	●	●	●●	●	●●	● 220 PPM	15%
POSITIVE	●●	●●●●	●●	●●	●●	●●	●	●● 250 PPM	15%

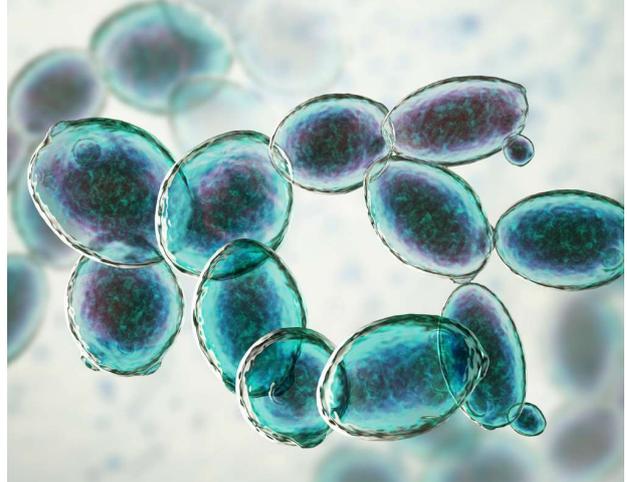
TYPE		NAME	SPECIES	APPLICATIONS	ORIGIN
REDS AND ROSE'	STRUCTURED	FERMOL PREMIER CRU	S. CEREVISIAE	RED WINES MEANT TO AGE	DIJON, FRANCE
		FERMOL MEDITERRANÉE	S. CEREVISIAE	RED WINES	CÔTES DU RHÔNE, FRANCE
		FERMOL SUPER 16	S. CEREVISIAE	RED WINES AND STUCK FERMENTATIONS	SAMOS ISLAND, GREECE
	FRUITY	FERMOL RED FRUIT	S. CEREVISIAE	FRUITY RED WINES	MODENA, ITALY
		FERMOL ROUGE	S. CEREVISIAE	RED WINES	REIMS, FRANCE
		FERMOL PB 2033	S. CEREVISIAE	ROSÉ AND YOUNG RED WINES	CÔTES DE PROVENCE, FRANCE
NON-CONVENTIONAL YEASTS	FERMOL KILLER FRU	S. CEREVISIAE	FRUCTOPHILIC/RESTART FERMENTATION	REIMS, FRANCE	
	FERMOL CRYOFRUIT	HYDRID S. BAYANUS/S. UVARUM	CRYOPHILIC/ COLD MACERATION	MODENA, ITALY	
	FERMOL ELEGANCE	HYDRID S. CEREVISIAE/S. BAYANUS	PREVENTING HYDROGEN SULFIDE	NA	
	GLUTAFERONE	S. CEREVISIAE VAR. CAPENSIS	WHITE AND ROSÉ WINES	MODENA, ITALY	
NON-SACCHAROMYCES YEASTS	PRIMAFLORA VR	M. PULCHERRIMA	BIOPROTECTION RED WINES	BURGUNDY, FRANCE	
	PRIMAFLORA VB	M. PULCHERRIMA	BIOPROTECTION WHITE WINES	BURGUNDY, FRANCE	
	LEVULIA ALCOMENO	L. THERMOTOLERANS	ACIDIFICATION	BURGUNDY, FRANCE	
	LEVULIA TORULA	T. DELBRUECKII	COMPLEXITY	BURGUNDY, FRANCE	

KILLER FACTOR	LAG PHASE	FERMENTATION	VA↑	S02↑	GLYCEROL↑	MALIC↓	FOAM	AVERAGE YAN	ETHANOL TOLERANCE
NEUTRAL	●	●●●	●	●	●●	●●	●	●● 270 PPM	16%
NEUTRAL	●●●	●●●	●●	●●	●●	●	●●	● 200 PPM	16%
SENSITIVE	●●	●●●	●●	●	●●●	●●	STRONG	●● 265 PPM	17%
POSITIVE	●	●●●	●	●	●●	●●	STRONG	● 220 PPM	15%
NEUTRAL	●	●●●	●	●	●●	●●	●●	●● 250 PPM	16%
NEUTRAL	●●	●●●	●●	●●	●●	●	●●	● 200 PPM	15%
POSITIVE	●	●●●	●	●	●●	●●	●●	●● - 250 PPM	17.5%
NEUTRAL	●●●	●	●	●●	●●	●	●	●● 260 PPM	15%
NA	●●	●●●	NA	NA	NA	●●	NA	● 200 PPM	15%
NEUTRAL	●●●	●	●●	●	●●	●●	●●	●● 260 PPM	15%
SENSITIVE	NA	NA	NA	NA	NA	NA	NA	NA	3%
SENSITIVE	NA	NA	NA	NA	NA	NA	NA	NA	3%
SENSITIVE	●●●	●●●	NA	NA	NA	NA	NA	NA	7%
NEUTRAL	●●●	●●●	NA	NA	NA	NA	NA	NA	9%

## **WHY WE USE DRY SELECTED YEAST:**

Yeasts, besides having organoleptic characteristics such as aroma, production of secondary compounds like glycerin, enzymes etc., are mainly used for:

- Avoiding stuck fermentations.
- Having limited volatile acidity.
- Not having anomalous odors, reductions, volatile phenols, oxidations, etc.
- Managing at best alcoholic fermentation compared to malolactic fermentation.
- Not having secondary compounds that may compromise the quality of the wine and the health of the consumer.



### **Prevalence and contamination**

It is estimated that in musts we have from  $1 \times 10^3$  to  $1 \times 10^5$  of polluting microorganisms per ml. To be sure of the prevalence we will always have to keep a minimum of  $1 \times 10^6$  per ml and have a ratio of 1:10 on the indigenous population.

So, if we use a dose of 20 g/hl (200 ppm) when inoculating we will have  $2 \times 10^6$  cells per ml, a more than enough quantity to achieve prevalence.

In case of *Botrytis Cinerea* contaminations, besides finding high quantities of yeast, we will also find numerous acetic and lactic bacteria and many other yeast species. For this reason, when inoculating unhealthy musts, we have to consider a higher dose of the selected yeast.

Reactiveur from AEB is a fully automated machine that guarantees a higher viability of the inoculum.

### **Do not wait too long:**

In the first 36 hours, the indigenous population grows to such a level that the selected yeast is no longer able to take the prevalence.

For example, the indigenous population doubles every 4 hours at 20°C, thus turning 9 generations in 36 hours, which means it multiplies 512 times.

It is evident that, if the prevalence is not taken immediately with the right number of cells, the fermentation will proceed: in the best scenario it will come to dryness, but it certainly will not have fermented with the inoculated strain.

### **A good inoculum is crucial for Biodynamic winemaking:**

Today's low impact techniques and climate change do not favor prevalence for several reasons:

- Low Sulphur dioxide.
- Mechanical harvesting.
- High pH-Values.
- Little rainfall, therefore high levels of microorganisms on the skins.
- Production according to organic methods and only copper as an anti-mold: high copper leads to indigenous yeast reduction on the skins or the development of resistant species, something that few oenological strains have.

In addition, many cultivation and environmental techniques, which are no longer used in the field, allow spoilage microorganisms to better develop on grapes.

### **Yeast multiplication at the winery and genetic drift:**

When wineries decide to multiply batches of yeast starting from one single "brick" they accept to run the risk of genetic drift, consisting in the variation of the genetic frequencies of a population due solely to chance. In an enological yeast, this leads to the loss of the selected characters over time, which can easily occur after 5-10 generations. Many of the modern strains are increasingly performing and selected to obtain numerous aromatic products, thus forcing the selection further and obtaining hybrid strains that are very performing. Nonetheless, in some cases, they are not fully genetically stable and they become easily subject to drift. The risk is a potential return of unwanted characters such as VA, fermentation stops, etc.

### **How "natural wines" can be bad for you:**

Biogenic amines are formed following the decarboxylation of certain amino acids. Since these amino acids are biologically active on the nervous and vascular system,

they can cause headaches, redness, palpitations and various allergic reactions in humans depending on their concentration and individual sensitivity. Biogenic amines are of fermentative origin as they come from the decarboxylation of amino acids by yeasts and in particular by bacteria. The increase in biogenic amines occurs after primary and especially malolactic fermentation and is largely strain dependent. The content is always higher in case of spontaneous malolactic fermentation.

The most frequent biogenic amines in wine are histamine, tyramine, and 2-phenylethylamine, which are highly toxic. In addition we find putrescine, cadaverine, spermine, and spermidine which, although not very toxic on their own, can enhance the effects of the other biogenic amines and represent possible precursors for the formation of nitrosamines, potentially carcinogenic substances.

The smartest thing to do to avoid the risk of biogenic amines formation is to carefully choose the strain of yeast and bacteria to be used, favoring those that have a low decarboxylating capacity (all of the AEB strains mentioned in this book have this characteristic). There are also other conditions that increase the biogenic amine content and therefore must be kept under control, such as high pH values and poor hygiene in winemaking.

### **Yeast and riboflavin, causing light-struck wines.**

Riboflavin, aka Vitamin B2, is a heterocyclic organic compound characterized by low solubility in water and produced by bacteria and yeast. If struck by light, riboflavin might undergo photolysis, the ribitol side chain is lost as a radical, and the biological effects of the vitamin are also lost as a consequence.

Because of this molecule, white and rosé wines, if exposed to light, might suffer an alteration of taste which is known as "light-struck taste".

The choice of the right strain is fundamental to avoid the onset of "light-struck" taste.



The Quality Control for AEB Oenological Yeasts. Scan for more info

## YEAST FOR WHITE WINES

### **Fermol Arome Plus**

**Applications:** it favors the expression of floral and typical notes of the grape variety. It shows a good fermentative aptitude, dominating fermentation rapidly. This strain is well adapted to low temperatures and ferments at levels between 50 and 60°F (10-15°C).

It's often preferred for attributes like roundness, aromatic characters, citrus, freshness, and persistence, which it communicates to varieties like Pinot Grigio, Sauvignon Blanc, Albariño, Chardonnay (best in co-fermentation with Fermol Chardonnay) and other semi-aromatic grape varieties. It's widely used in Italy for Moscato d'Asti.

### **Tasting notes**

- Citrus, white flowers, tropical fruit: medium.
- Floral, white pulp fruit: high.



**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: When using this strain, be aware of the high YAN demand.*

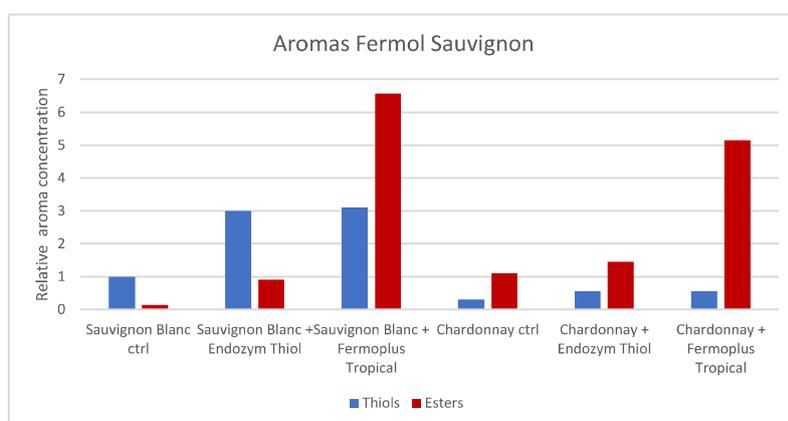
## Fermol Sauvignon

**Applications:** good implantation. Regular and complete fermentation of sugars.

Releases the aromatic sulfur compounds (thiols) typical of the Sauvignon grape variety (box-tree, passion fruit, grapefruit). Participates in the aromatic complexity.

### Tasting notes:

- Citrus: medium.
- Box-tree, passion fruit, grapefruit: high.
- White flowers, aromatic herbs: high.



Aroma enhancement of Fermol Sauvignon in Sauvignon Blanc and Chardonnay grapes. Histogram compares primary aromas (thiols) and secondary aromas (esters) after the addition at the beginning of fermentation of 300 ppm of Fermoplus Tropical or 5 ml/hL of Endozym Thiol. The use of Endozym thiols results in an expression of the varietal compounds, while the Fermoplus Tropical results in an increased complexity, with primary and secondary aroma enhanced. Tondini et al. (2019). The Effects of Pre-fermentative Additions on Yeast Volatile Aromas and Thiols in Sauvignon Blanc and Chardonnay. Poster presentation ASEV/AWITC 2019.

### Available in 10 kg bags and 500 gram packs.

*Winemaker's note: When fermenting with Fermol Sauvignon, add Fermoplus Tropical (250 ppm or 2 lbs./1000 gal) to maximize tropical notes and complexity, or Endozym Thiol (50 ppm) to increase varietal expression.*

## Fermol Chardonnay

**Applications:** the aromas developed are complex and intense, thus obtaining full-bodied and elegant wines. It is a strain of yeast particularly indicated for the fermentation of Chardonnay musts in barrel.

### Tasting notes:

- White flowers, floral, sweet aromas, dry fruit: medium.
- Summer fruits, tropical fruits: high.

### Available in 10 kg bags and 500 gram packs.



*Winemaker's note: this strain produces very fine lees that immediately release polysaccharides into the media, giving a smooth and viscous mid-palate which is desired not only in Chardonnay but for all the wines matured sur-lie*

### **Fermol Blanc**

**Applications:** delivers clean and vibrant wines even in adverse conditions, helps with sluggish and stuck fermentations. Possesses a flocculent character.

Recommended also for fruit wines, hard seltzers, ciders, and honey mead.

### **Tasting notes:**

- Citrus, white flowers, floral, sweet aromas: medium.
- White pulp fruit, summer fruit: high.



**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: It is resistant to adverse conditions, like low nutrition, cold temperatures, or high alcohol.*

## **AROMATIC YEAST COLLECTION**

Thiols are a class of organosulfur compounds much appreciated by consumers: 4MMP ("boxwood" and "blackcurrant"), 3MH ("passion fruit", "grapefruit" and "citrus"), and 3MHA ("tropical", "passion fruit" and "rose"). Fermol Floral, Fermol Lime and Fermol Tropical were selected for their enhanced oenological features to boost varietal thiols aroma, but also to specifically increase the sensory perception of more neutral varieties.

### **Fermol Fleur, Fermol Lime and Fermol Tropical**

**Applications:** suited for all types of white wines for which a well-defined aromatic bouquet is sought. Highly recommend for the elaboration of modern rosé wines and indicated for the fermentation of musts from warm regions where retaining acidity is important.



Data from different fermentations showed that Fermol Fleur offers generally a consistent high thiols production. Fermol Lime, instead, presents good thiol production but is low on 3MHA (gooseberry, sweet sweaty, cat-pee) and 4MMP (broom, box tree and cat pee). Still, the production of 3MH (grapefruit, citrus) remains very high in Fermol Lime.

In the same research the formation of esters is what really distinguished the Fermol Lime and the Fermol Fleur from other standard products. All the floral esters were highly present in the fermentation with Fermol Fleur. All the citrus esters were highly present in the fermentation with Fermol Lime.



Fermol line of yeast for thiols enhancement. Scan the code to learn more about AEB yeast selection



#### **Characteristics:**

- Ideal fermentation temperature: between 55-62 °F/12-16 °C.
- Nutritional requirements: medium. With correct amino acid nutrition, the production of esters and

aromatic acetates is increased. In some varieties, the aromatic profile is linked to the presence of specific precursors such as cysteine and glutathione, enhancing the aromas produced by this strain.

- Low malic consumption (<10%).

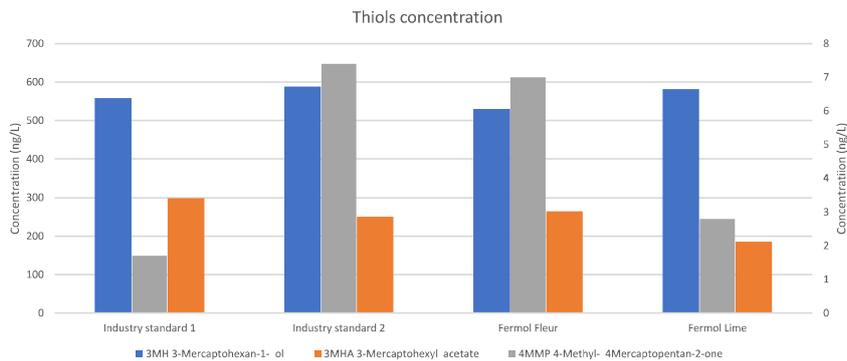
#### **Tasting notes:**

**Fermol Fleur:** white flowers, with balsamic and mentholated notes perceived through the back of the nose.

**Fermol Tropical:** reveals notes reminiscent of summer and tropical fruits, scents of sage.

**Fermol Lime:** bouquet dominated by citrus aromas with hints of aromatic herbs.

**Available in 500 gram packs.**



Thiols' release (3MH and 4MMP) and production (3MHA) by different yeast strains. Fermol Fleur excels in 4MMP release from its glutathione precursor, whereas Fermol Lime has higher efficiency in releasing 3MH from its cysteine precursor. \*4MMP is represented on the secondary axis.



Esters produced by different yeasts during fermentation. Fermol Fleur has higher acetate esters production which derive from amino acids metabolism, whereas Fermol Lime produces more ethyl esters, which are the result of the esterification of fatty acetyl and acetyl-CoA.

## **SPARKLING YEAST COLLECTION**

AEB yeasts for sparkling are recommend for base and sparkling wine production, but also for resumption of alcoholic fermentation. Their optimal temperature is 62°F - 16 °C and they have low nitrogen needs. Please see the "Guide to sparkling biotechnologies innovations and quality management" chapter for more information.

## **YEAST FOR REDS & ROSÉ WINES**

### **Fermol Premier Cru**

**Applications:** it is very respectful of the varietal in terms of aromatics. It produces high levels of polysaccharides, and it actively extracts tannins and color from the skins, making it the perfect yeast to obtain full-bodied, structured, and complex wines (Pinot Noir,



Merlot, Sangiovese, Cabernet, and Syrah).

**Tasting notes:**

- White pulp fruits, aromatic herbs, spices: medium.
- Wild and red berries: high.

**Available in 10 kg bags and 500 gram packs.**

**Fermol Mediterranée**

Applications: ideal for obtaining structured red wines suitable for ageing. Amplifies the sweet notes reminiscent of strawberry and red fruit aromas characteristic of southern wines. Ability to produce a significant quantity of polysaccharides.

**Tasting notes:**

- Red berries: medium.
- Wild berries, summer fruits, sweet aromas: high.

**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: It has minimal or none SO<sub>2</sub> production, facilitating MLF. It also requires minimal YAN to complete the fermentation.*

**Fermol Super16**

Applications: specific strain of *Cerevisiae-cerevisiae* for vinification in difficult conditions, such as high temperature and high sugars. Complements a clean bouquet of fresh fruit, with a long and complex finish in the mouth.

**Tasting notes:**

- Citrus, summer fruits, wild berries: medium.
- Floral, sweet aromas: high.

**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: it actively produces pectinase enzymes, facilitating extraction and yielding, resulting in a "clean" wine right after fermentation.*

## Fermol Red Fruit

**Applications:** yeast developed in the same hybridization program of the Fermol Lime/Fleur/Tropical. It is designed for young red or rosé wines when fresh esters and thiols are desired. It features superior fermentation capacities even under difficult conditions. Its natural oenological aptitudes limit the production of volatile acidity, so that the wines obtained are characterized by a beautiful aromatic freshness and a great sharpness in the mouth. It is known to highlight aromatic notes of berries such as blueberry, blackcurrant, and raspberry, while respecting the typicity of the grape.



**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: using it with Pinot noir or Grenache enhances blackcurrant varietal aromas.*

## Fermol Rouge

**Applications:** it is particularly recommended to produce young red wines and modern rosé with intense red berries aromas and good structure. It produces wines with more intense color, given its limited ability to bind the coloring substances extracted during grape maceration.



### Tasting notes:

- Wild berries, dried fruit, aromatic herbs, spices: medium.
- Red berries: high.

Considered a workhorse for red fermentations, it resists to adverse conditions like hot fermentations and low nutrition.

**Available in 10 kg bags and 500 gram packs.**

*Winemaker's note: the short lag-phase, followed by a fast and regular fermentation curve, makes Fermol Rouge ideal for optimizing tanks turnover.*

### **Fermol PB2033**

**Applications:** specific yeast for the vinification of rosé and young red wines. It develops intense and persistent floral and fruity aromas. Very good production of glycerol. Low color fixation optimized rosé color.

**Tasting notes:**

- Floral, wild berries: medium.
- White flowers, red berries: high.

**Available in 10 kg bags and 500 gram packs.**

## **NON-CONVENTIONAL YEASTS**

### **Fermol Complete Killer Fru**

**Applications:** a *S. bayanus* selected for its killer factor and fructophilic characteristics, it is utilized to restart stuck fermentations in red and white wines. In fact, Fermol Complete Killer Fru can metabolize the sugar fraction composed by fructose, while other strains often leave it behind. It's highly cryophilic so it is suitable for use in wines that are not at ideal temperatures.

**Tasting notes:**

- Floral, white pulp fruits: medium.
- White flowers: high.

**Available in 10 kg bags and 500 gram packs.**

*See FAQ to learn how to use Fermol Complete Killer Fru to restart a stuck fermentation.*

### **Fermol Cryofruit**

**Applications:** yeast resulting from hybridization, with cryophilic character. Its use is optimal either during cold maceration or during fermentation at low temperature (from 8°C - 45°F). Early inoculation controls for the development of the indigenous microflora which can be at the origin of organoleptic defects.



It produces aromatic, expressive, and fruity wines. Its natural ability to produce glycerol makes it possible to obtain full and balanced wines, with soft and smooth taste sensations.

**Tasting notes:**

- White flowers, floral: medium.
- Wild and red berries: high.

**Available in 500 gram packs.**

**Fermol Elegance**

**Applications:** yeast unable to process the sulfur that could be picked up from the environment by the yeast (excessive treatment in the vineyard or high SO<sub>2</sub> added into the grapes). In other strains, this can result in high H<sub>2</sub>S. Fermol Elegance is obtained from natural hybridization characterized by excellent fermentation kinetics and the capacity to enhance a wide aromatic range. It has a beneficial effect on the release of terpenes glycosides and accentuates the synthesis of  $\beta$ -phenylethyl acetate.

This results in a bouquet that is elegant and free from reductive odors.

**Available only in 500 gram packs.**

**Glutaferm ONE**

**Applications:** yeast resulting from hybridization, characterized by high production and release capacities of glutathione, which makes it possible to preserve the sharpness and the aromatic freshness while respecting the varietal characteristics of the grape. It is particularly adapted to the production of premium white and rosé wines, for which the aromatic intensity must be preserved during ageing.

**Available in 500 gram packs.**

## **NON-SACCHAROMYCES YEASTS**

### **What about non-saccharomyces yeasts?**

In recent years, yeasts belonging to a different genus than *Saccharomyces* have found their way in the cellars. While traditional yeasts allow the technological requirements for the proper conduct of alcoholic fermentation to be maintained, these strains provide new functions: increase in aromatic complexity, production of relevant molecules (glycerol, thiols, organic acids), reduction of ethanol content or pre-fermentation protection. Over the last few years, AEB in collaboration with University of Dijon, isolated and marketed yeast species with relevant metabolic features: *Torulasporea delbrueckii* (Levulia Torula), *Lachancea thermotolerans* (Levulia Alcomeno) and *Metschnikowia pulcherrima* (Primaflora).



### **Levulia Alcomeno (Certified Organic):**

Belongs to the species *Lachancea thermotolerans*, a yeast strain naturally present on the grape berry, contributing to the organoleptic complexity of wine. *Levulia Alcomeno* carries out the lactic fermentation from sugars, thus making wine fresh and balanced to the mouth. The result is a high increase in total acidity and a decrease in the alcohol content. At the analytical level, wines fermented with *Levulia Alcomeno* are differentiated by a decrease in the alcohol content and an increase in TA. *Levulia Alcomeno* can perform the alcoholic fermentation up to 7% v/v of ethanol. It then requires sequential inoculation with another desired yeast.

**Available in 500 gram packs.**

## **LEVULIA ALCOMENO WINEMAKING TRIAL 2020**

Grapes from hot climates often contain excessive sugars and low acidity. This can result in wines with high alcohol content and lack of stability and balance. The yeast *Levulia Alcomeno* (*Lachancea thermotolerans*) can ameliorate such wines due to moderate lactic acid production from sugars during alcoholic fermentation.

*Levulia Alcomeno* has been used to produce Rosé wine from Cabernet juice (Saignée method). The trial reduced the addition of tartaric acid and the ethanol concentration resulting in a more balanced taste.

Alcohol	13.19	%
pH	3.2	pH
Titrateable Acidity	7.09	g/L
Molecular SO <sub>2</sub>	0.36	ppm
Malic ACid	1.28	g/L
Residual Sugar	7.8	g/L
Volatile acidity	0.44	g/L
Malic Acid	1.28	g/L
Residual Sugar	7.8	g/L
Volatile Acidity	0.44	g/L

Table 1: Wine chemical parameters 02/01/2021.

In addition, based on the latest scientific research (Hranilovic et al. 2021), AEB recommends Levulia Alcolmeno to ferment Merlot and to create the perfect component for Bordeaux blends in hot climates.



**Levulia Torula (Certified Organic):** a yeast strain belonging to the species *Torulasporea delbrueckii*. It contributes positively to the organoleptic complexity of the wine while limiting the production of volatile acidity. It reduces the sensations of astringency in the mouth thanks to the release of polysaccharides.

Levulia Torula is suitable for all types of grape varieties, rich in terpenes and/or thiols (Sauvignon Blanc, Chardonnay, Gewurztraminer, Colombard, Riesling, Muscat, Sémillon, etc.) because of its high enzymes production (glucosidase and sulfur-lyase).

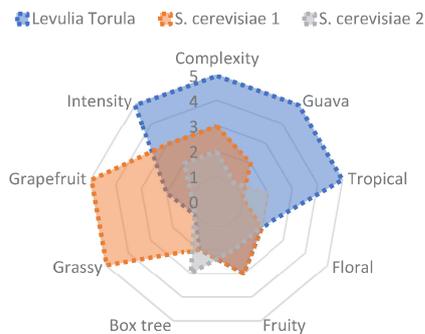
Levulia Torula can ensure the alcoholic fermentation up to 9% v/v of ethanol and can be used alone, in co-inoculation, or sequential inoculation (24 to 48h) with the desired *S. cerevisiae*.

## LEVULIA TORULA WINEMAKING TRIAL 2020

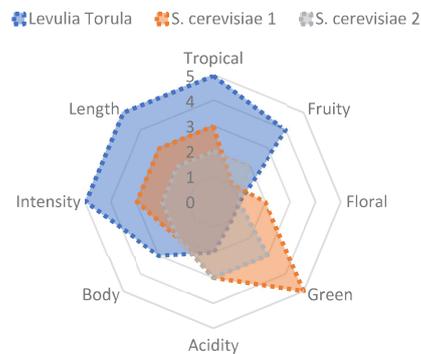
New alcoholic fermentation trends have begun to consider how to improve flavor diversity. This trial explored the influence of non-Saccharomyces yeast *Levulia Torula* yeast (*Torulaspora delbrueckii*) on wine quality parameters and sensory perception, compared to two other commercial *Saccharomyces*.



### AROMA



### FLAVOR AND MOUTHFEEL



*Levulia Torula* positively contributes to the organoleptic complexity of the wine and reduces the sensations of astringency/harshness. The graphs show the sensory evaluation score (aroma, flavors and mouthfeel) of the wines made with *Levulia Torula* versus two different commercial yeasts.

Wine chemical parameters remained very similar between treatments, but *Levulia Torula* showed a notable mannoprotein and polysaccharide release ability in wine, which increases the mouthfeel properties of wine and can produce higher levels of fruity esters, thiols, and terpenes.

Following 2020 winemaking trials, AEB recommends the usage of *Levulia Torula* to enhance “warm” tropical characteristics in Sauvignon blanc. In addition, it adds texture, thus prolonging flavors and cutting through acid and green harshness in other grape variety such as Riesling, Chardonnay, Pinot Gris, but also Merlot, Cabernet Sauvignon, Syrah and, Zinfandel.

## **SEQUENTIAL INOCULATION PROTOCOL:**

1. Rehydrate Levulia Torula or Levulia Alcomeno in lukewarm water (80°F/25°C) for 20 minutes with Fermoplus Energy Glu.
2. Inoculate the selected non-Saccharomyces yeast at 250 ppm at a wine temperature of 62°F/16°C.
3. 24-72 hours after, or at 1/3 fermentation, rehydrate the selected Fermol yeast at 100 °F/38°C with Fermoplus Energy Glu.
4. Inoculate 250 ppm of Fermol yeast and add 120-240 ppm of Fermoplus Integrateur
5. Adjust temperature fermentation.

*Max SO2 concentration in juice 30 ppm.*

### **Primaflora (Certified Organic):**

Primaflora is a non-Saccharomyces yeast, belonging to *Metschnikowia pulcherrima* specie. One of the characteristics of this strain is a strong anti-Brettanomyces and antibacterial activities due to its production of pulcherrimic acid that depletes the media from iron, thus creating unfavorable conditions for Brett (Oro et al., 2014). A second characteristic is that *Metschnikowia pulcherrima* also contributes up to a certain extent to the release of terpenes aromas ( $\beta$ -glucosidase) and nitrogen enrichment of the must (protease) thanks to Primaflora's enzymatic activity.



Discover Bioprotection with Primaflora. Scan the code to learn more.

## **PRIMAFLORA APPLICATION**

- 1.** Rehydrate 500 g of Primaflora in 10 liters of mineral or non-chlorinated water (at 80°F/25°C), with 500 ppm of sugar (5%) for 15 minutes.
- 2.** Distribute onto the grapes or add to the must and homogenize. Do not store the Primaflora solution for more than 45 minutes or viability will decline.
- 3.** Double the volume with grape must to prolong the life of the solution by 3 hours. Increase five folds the volume with grape must to prolong the life of the solution by 12 hours.

*Do not use sulfites.*



## **YEAST REHYDRATION AND ACCLIMATION**

- 1.** Using clean and sanitized equipment, prepare 10 liters of warm water per kilogram of yeast (1.2 gallons of water per pound). The ideal temperature is 38°C (100°F) for *Saccharomyces cerevisiae* and bayanus strains.
- 2.** While stirring, slowly add 250 grams of the rehydration nutrient Fermoplus Energy

GLU per kilogram of yeast (1:4). Be sure that all clumps are broken up and well-mixed. Slowly mix-in the yeast, again making sure to break up all clumps. Do not mix using a drill or any aggressive mixing technique that might cause shearing of the yeast cells. Make sure that the mixture gets plenty of oxygenation. This, along with the nitrogen supplied by the Fermoplus Energy Glu, will build a bigger and stronger yeast biomass.

**3.** After 20-30 minutes the yeast is fully rehydrated and will now need a sugar source to stay viable.

**4.** Portions of must are gradually added to the yeast mixture in small increments while gently stirring. Normally an equal amount of must is slowly mixed into the yeast mixture over a span of time of 5 minutes. While adding the must, monitor the temperature and make sure it does not drop more than 5°C/10°F at any time during this must addition.

**5.** After 15 minutes, slowly add an equal amount of must to the mixture, again making sure the temperature does not drop more than 5°C/10°F.

**6.** Repeat this step every 15 minutes until the yeast mixture is within 5°C/10°F of the tank temperature. Add the inoculum to the must in the tank and ensure that the tank is properly vented to release pressure.

### **HOW TO RE-START A STUCK OR SLUGGISH FERMENTATION:**

**1.** Rack the wine off the gross lees into a sanitized tank.

**2.** While racking, add 180 ppm of Celloferm to the receiving tank. Celloferm will help purify the compromised must from toxins and contaminants.

**3.** In a tub, bring 250 mL water for every hL of stuck wine to treat (2.5 gal water/1000 gallons wine) to 40°C (104°F).

**4.** Add 60 ppm of Fermoplus Energy Glu rehydration nutrient.

**5.** Add to this mixture 250 ppm of Fermol Complete Killer Fru yeast according to the total volume of the stuck wine.

- 6.** Mix the yeast and nutrient thoroughly with a paddle.
- 7.** Let the yeast rehydrate for 20 minutes.
- 8.** Check the temperature of the yeast mixture before moving on to step 9.
- 9.** Take out of the problematic tank 250 mL of stuck must per hL of its total volume.
- 10.** Add this to the yeast mixture, making sure that during the addition the temperature does not change more than 5°C/10°F.
- 11.** Add 250 ppm grams of light white grape concentrate to the yeast slurry depending on the total volume of the stuck wine.
- 12.** Take a sample of this starter and measure the RS, if possible.
- 13.** Cover and hold for 12 hours in a warm part of the cellar. Maintenance of the temperature at around 21°C (70°F) is recommended.
- 14.** Check the RS. Make sure that there are signs of active fermentation before moving to the next step (a RS drop will confirm yeast activity).
- 15.** Transfer yesterday's start-up from the tub into the small wine tank.
- 16.** Slowly add 750 mL of stuck wine per hL of total volume of stuck wine and 150 ppm of light grape concentrate to the small tank. Adjust according to the total volume of the stuck wine. Stir well.
- 17.** Record the RS and hold over night. Make sure the small wine tank is vented.
- 18.** Check once more that the mixture is actively fermenting before moving on.
- 19.** Add 10 more liters of stuck wine for each hL of total wine to the small tank and mix well. Hold for another night.
- 20.** Transfer the small tank to the stuck wine tank and mix well. If possible, maintain the tank temperature between 21-24°C (70 - 76°F). Monitor RS regularly.

**CHAPTER THREE**

**Yeast Nutrients**

	YEAST NUTRIENT	NITROGEN	MAIN COMPOSITION	PPM OF YAN ADDED FOR 120 PPM ADDITION OF PRODUCT
REHYDRATION NUTRIENT	FERMOPLUS ENERGY GLU 3.0	ORGANIC	YEAST EXTRACT	N/A
VARIETAL NUTRIENTS	FERMOPLUS DAP FREE	ORGANIC	YEAST AUTOLYSATE	8-10
	FERMOPLUS FLORAL	ORGANIC	YEAST AUTOLYSATE	8-10
	FERMOPLUS TROPICAL	ORGANIC	YEAST AUTOLYSATE	8-10
	FERMOPLS PROSECCO	ORGANIC	YEAST AUTOLYSATE	8-10
	FERMOPLUS SAUVIGNON	ORGANIC	YEAST AUTOLYSATE AND SKIN TANNINS	8-10
	FERMOPLUS PYROFF	ORGANIC	YEAST AUTOLYSATE AND YEAST HULLS	4
	FERMOPLUS INTEGRATEUR	INORGANIC AND ORGANIC	YEAST AUTOLYSATE AND DAP	18
FERMENTATION NUTRIENTS	AUXILIA	ORGANIC	YEAST HULLS	4-8
	FERMOPLUS BLANC VARIETAL	INORGANIC AND ORGANIC	YEAST AUTOLYSATE, DAP AND ELLAGIC TANNINS	13
	FERMOPLUS PREMIER CRU	INORGANIC AND ORGANIC	YEAST AUTOLYSATE, DAP AND ELLAGIC TANNINS	14
	ENOVIT P	INORGANIC	DAP	25
	FERMENTATION AIDS	CELLOFERM	N/D	CELLULOSE
FERMOCEL P		INORGANIC	DAP AND CELLULOSE	11

CHARACTERISTICS	INORGANIC THIAMINE: MAX DOSING RATE	OTHER FEATURES
ADDED DURING HYDRATION TO BOOST THE BIOMASS FROM 3 TO 6 FOLDS	0.3%; 1.6 LBS/1,000 GALLONS (20G/HL)	ORGANIC VITAMINS; ORGANIC STEROLS; RICH IN GLUTATHIONE ; FAST ABSORPTION
ADDS TO THE AMINO ACIDS CONTENT. GEARED TO BRING A GENERIC BOOST OF AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS TO THE CISTEIN AND AMINO ACIDS CONTENT. GEARED TO BOOST FLORAL AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS TO THE AMINO ACIDS CONTENTS. GEARED TO BOOST TROPICAL AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS TO THE AMINO ACIDS CONTENTS. GEARED TO BOOST SPARKLING WINE AROMAS AND TO PROMOTE A HEALTHY FERMENTATION	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS AMINO ACIDS CONTENT AND VARIETAL PRECURSORS TO BOOST THIOL AROMAS (PASSION FRUIT, GRAPEFRUIT, BOX TREE) . PROMOTES A HEALTHY FERMENTATION	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS AMINO ACIDS AND PROMETE AN HEALY FERMENTATION. GEARED TO THE REMOVAL AND MASKING OF METHOXYPIROZINES	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AMINO-ACIDS	0.06% ; 8.3 LBS/1,000 GALLONS (100G/HL)	ORGANIC VITAMINS; ORGANIC STEROLS
ADDS TO THE AMINO ACIDS CONTENT AND ESSENTIAL NUTRIENT. CERTIFIED FOR ORGANIC WINEMAKING	NOT ADDED	ORGANIC VITAMINS; ORGANIC STEROLS
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AMINO-ACIDS AND ELLAGIC TANNINS	0.06% ; 8.3 LBS/1,000 GALLONS (100G/HL)	ORGANIC VITAMINS; ORGANIC STEROLS
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AMINO-ACIDS AND ELLAGIC TANNINS	0.06% ; 8.3 LBS/1,000 GALLONS (100G/HL)	ORGANIC VITAMINS; ORGANIC STEROLS
DAP AND VIT. B1 (THIAMINE)	0.1%; 5 LBS/1,000 GALLONS (60G/HL)	N/D
ADDS A COMPONENT FOR TOXINS ADSORPTION PLUS FACILITATES NUCLEATION AND DISPERSION OF THE YEAST CELLS	NOT ADDED	REMOVE METAL IONS
ADDS A COMPONENT FOR TOXINS ADSORPTION PLUS FACILITATES NUCLEATION AND DISPERSION OF THE YEAST CELLS. ALSO PROVIDES HIGH YAN	0.2%; 2.5 LBS/1,000 GALLONS (30G/HL)	REMOVE METAL IONS

## Why Add Yeast Nutrients?

- Fast start and vigorous fermentation
- High cell vitality and viability
- Increase ethanol tolerance
- De-novo biosynthesis of aromas
- Release of varietal aromas
- Lower H<sub>2</sub>S production
- Off-flavors removal

## REHYDRATION NUTRIENTS



### **Fermoplus Energy Glu 3.0:**

Booster for the yeast biomass and multiplication speed, to be added in the rehydration tab. The amino acids are immediately available to the yeast cell, resulting in an addition rate much lower than most re-hydration nutrients available.

**Usage:** dissolve directly in the rehydration water along with the yeast.

**Dosage:** 1:4 compared to yeast inoculum, i.e., 250 ppm of yeast will need 60 ppm of Fermoplus Energy Glu.

**Packaging:** 1kg, 5 kg & 20 kg bags.

**Shelf life and storage:** Fermoplus Energy Glu is stable at room temperature for at least two years.

### **Why Glutathione during rehydration?**

Glutathione is a natural antioxidant that the yeast uses to protect its organs from free radicals and to ensure that yeast cells are not damaged by the high oxidative activity during rehydration. When cells are dry, they don't have an immediate availability of glutathione and, therefore, they can benefit from the addition supplied with Fermoplus Energy Glu 3.0.



Discover how rehydrating your yeast is with Fermol Energy Glu 3.0. It can help you boost the vigor of your yeast addition. Scan the code to learn more.

## VARIETAL NUTRIENTS

### How to enhance the bouquet of wines with AEB nutrients?

To enhance the aromatic profiles of wines, specific amino acids allow the yeasts to conduct a regular fermentation and express the desired varietal and fermentation aromas. Multiple grape varieties were analyzed including the Portuguese Antão Vaz; Glera (Prosecco); Grüner Veltliner; and the best-known Syrah, Cabernet Sauvignon, Chardonnay, and Sauvignon Blanc. Based on this research, AEB was able to create new yeast nutrients characterized by an amino acid profile to implement targeted grape varieties.

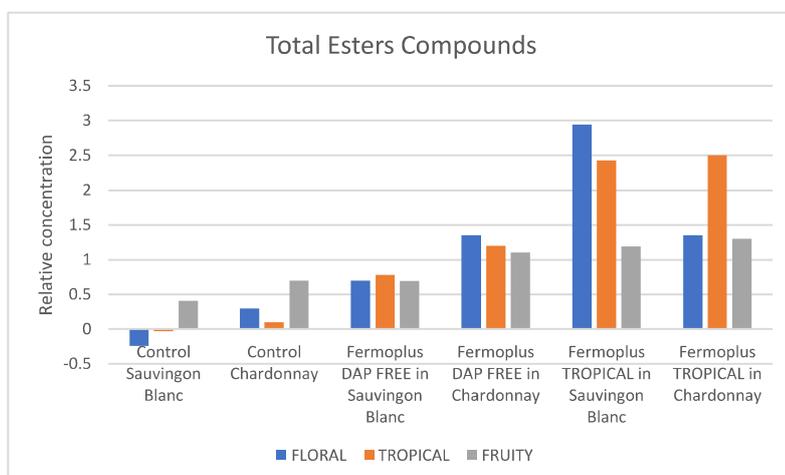
#### Features:

- Organic nitrogen
- Organic vitamins
- Sterols
- Aroma precursor
- Fermentation booster



Enhance the bouquet of wines with our varietal nutrients. Scan the code to learn more.

**Why add amino acids?** There is a link between amino acids and aromatic molecules. Volatile esters, responsible for fruity, tropical, and floral fermentation aromas, are produced by yeast through the Ehrlich pathway: an amino acid is first degraded through a series of enzymatic reactions to a higher alcohol and further combined with a carboxylic acid to form a volatile ester.



Among the most important factors influencing wine quality is the presence of well-adjusted amounts of higher alcohols and esters. Yeast forms these aromatic compounds during fermentation. Graph shows the relative concentration of esters and higher alcohol -grouped by aroma descriptors - of control wine/no addition, 400 ppm addition at the beginning of fermentation of DAP FREE or TROPICAL, in Sauvignon Blanc and Chardonnay musts. Tondini et al. (2019). The Effects of Pre-fermentative Additions on Yeast Volatile Aromas and Thiols in Sauvignon Blanc and Chardonnay. Poster presentation ASEV/ AWITC 2019.

**Fermoplus Tropical:**

Nutrient rich in specific organic amino acids that are essential for the characterization of wines with an aromatic “tropical” profile, referable to Antão Vaz and Chardonnay.

**Packaging:** 5kg bags



**Fermoplus Prosecco:**

Nutrient rich inorganic amino acids, ideal for the fermentation of sparkling wine bases method Charmat. The utilization of Fermoplus Prosecco guarantees the production of floral and fruity aromas, ranging from summer fruits to aromatic herbs and flowers, with citrus nuances, referable to Glera grapes.

**Packaging:** 5kg bags.



**Fermoplus Floral:**

It is indicated for white and rosé fermentations to highlight the aromatic profile; it amplifies floral and slightly fruity notes, and the aromatic herbs, referable to Grüner Veltliner.

**Packaging:** 5kg bags



**Fermoplus DAP Free:**

It is indicated to promote a healthy yeast population and enhances the fruity and spicy characteristics of red grape varieties.

**Packaging:** 5, 10 and 25 kg bags.



**Fermoplus Sauvignon:**

Rich in aromatic thiols precursor, it produces and emphasizes passion fruit, box tree and grapefruit notes, such as in the bouquet of Sauvignon.

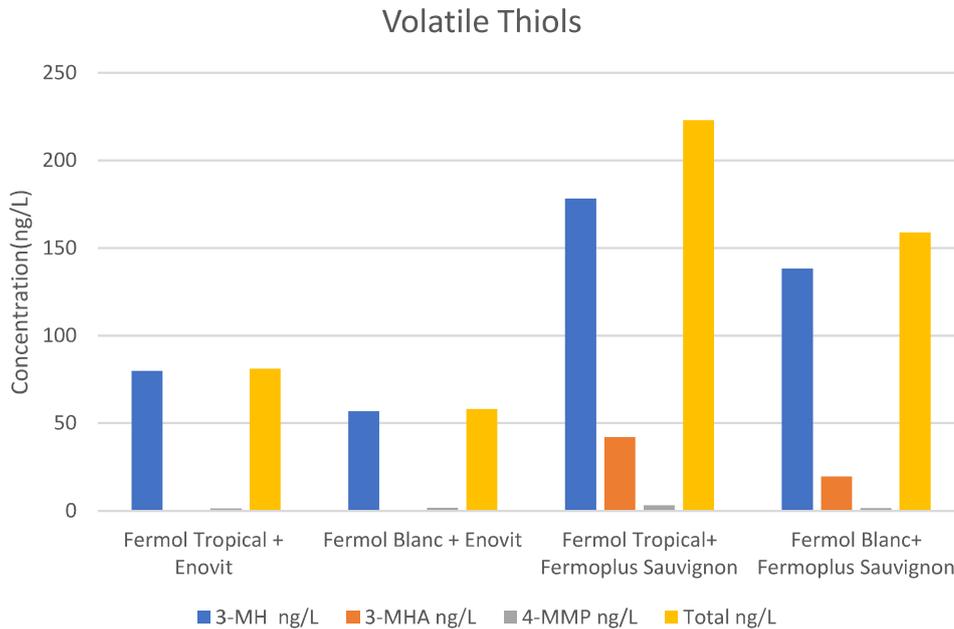
**Packaging:** 5kg bag.



**Usage:** Add at the beginning of the fermentation. 8-10 ppm YAN every 120 ppm.

**Dosage:** Standard addition is 20-40 ppm.

**Shelf life and storage:** Stable at room temperature for at least two years.



Graph shows volatile thiols concentration after addition of 40 g/hL of Fermoplus Sauvignon in Sauvignon blanc fermentations. The nutrient, specific for white grapes, can accentuate the varietal aromatic characteristics. The use of this nutrient in must from grapes rich in thiol precursors allows the typical aromas of this variety to be perceived much more clearly, while its addition in neutral varieties add these notes, thus increasing the complexity.

### Fermoplus PyrOff:

Nutrient based on autolysate and yeast cell walls with a high adsorbent power. The functioning of this nutrient is based on the synergistic action of lysate and yeast cell walls. Lysate promotes vigor fermentation and the aroma production of the yeast. The cell walls are essential for adsorbing methoxypyrazine, which is responsible for green/bell pepper notes in Cabernet Franc, Cabernet Sauvignon, Merlot, Pinot Noir, Sauvignon Blanc, Chardonnay, and Riesling.

**Usage:** Add Fermoplus PyrOff right after pectolytic enzymes have finished their activity. It causes the methoxypyrazines released from the skins to be immediately adsorbed and subsequently eliminated.

**Dosage:** 200-800 ppm. Adds 4 ppm of YAN every 120 ppm.

**Packaging:** Available in 5 and 20 kg bags.



Fermoplus PyrOff

## **FERMENTATION NUTRIENTS:**

### **Fermoplus Integrateur:**

Complex nutrient based on DAP and yeast lysate. It has a high NH<sub>4</sub> content to quickly increase the YAN. It also has all the benefits of yeast extract, including a boost in aromatics given by the amino acidic content, vitamins, trace elements, and sterols to keep the yeast healthy.

**Dosage:** 120 ppm adds 18 ppm of YAN.

**Packaging:** 1kg vacuum-sealed packs, 5 and 20 kg bags.



### **Auxilia:**

Yeast nutrient certified for organic wine production which improves the fermentation chances to finish and decreases the production of volatile acidity from yeasts.

It also improves the fermentability of sparkling wine bases by adsorbing fermentation inhibitors.

**Packaging:** 1kg bags.

**Fermoplus Blanc Varietal:** contains specific natural antioxidants (ellagic tannins) and amino acids in order to enhance and protect white wine aromatics.

**Usage:** 120 ppm adds 13 ppm of YAN.

**Packaging:** 5 kg bags.

**Fermoplus Premier Cru:** contains natural mannoproteins, ellagic tannins, amino acids and B vitamins for enhancing the varietal qualities of red wines.

**Dosage:** 120 ppm adds 14 ppm of YAN.

**Packaging:** 5 kg bags.

**Enovit P:** Mainly composed of nitrogen salts of DAP with added Thiamin. It brings a large amount of ammonia (NH<sub>4</sub>) for a quick boost of the YAN.

**Dosage:** 120 ppm adds 24 ppm of YAN (about 20%).

**Packaging:** 25 kg bags.

**Usage:** 200-400 ppm divided in 2-3 staggered additions.

**Shelf life and storage:** Stable at room temperature for at least two years.

*Winemaker's note: staggered nitrogen additions at the beginning and at 1/3 of the fermentation are proven to be useful for faster fermentation.*

### **Why add thiamine to nutrients?**

Although *S. cerevisiae* can synthesize thiamin de-novo, lack of thiamin in the must leads to slow metabolic activity and may lead to sluggish or stuck fermentation.

## **FERMENTATION AIDS:**

### **Fermocel P:**

Nutrient/bio-regulator increases turbidity and YAN. The cellulose contained in Fermocel P helps with yeast nucleation, adsorption of toxins, and long chain fatty acids. Nitrogen salts (DAP) produce a large amount of ammonia nitrogen that immediately raises the YAN level.

**Dosage:** standard addition is 120-360 ppm (12-36 ppm YAN)

**Packaging:** 25 kg bags.

### **Celloferm:**

A bio-regulator in powdery form, based on very pure celluloses with long polysaccharide chains. It absorbs toxin compounds inhibiting or slowing down the yeast activity and rapidly activates fermentations acting as a support, thus facilitating the homogeneous dispersion of the yeast. It also binds positive metal ions such as  $Fe^{+++}$  and  $Cu^{++}$ .

**Dosage:** 120-240 ppm.

**Packaging:** 10 kg bags.

**Usage:** make a slurry in 20 parts of must or stuck wine and add to the tank right after having pitched the yeast.

**Shelf life and storage:** sealed containers are stable at room temperature for at least two years.

## **YEAST NUTRIENTS ADDITION PROTOCOL**

- 1.** Add 0.5 lb/1000 gal Fermoplus Energy Glu 3.0 in rehydration to ensure fast yeast adaptation and to increase fermentation performance.
- 2.** Add 100-200 ppm of organic nitrogen nutrients (Dap Free, Tropical, Floral) right after inoculation.
- 3.** Calculate the total YAN requirement, depending on the yeast strain, juice chemical analysis, and fermentation parameters: YAN addition will be equal to the target YAN minus the available YAN.
  - *Very low/ low YAN requiring strains = Brix x 7.5*
  - *Medium YAN requiring strains = Brix x 9*
  - *High YAN requiring strains = Brix x 12.5*

Fermentations prolonged using low temperatures (<12 C) will need about 20% extra YAN.

- 4.** Target your YAN with DAP containing nutrients at 1/3 of the fermentation (e.g. 100-200 ppm Fermoplus Integrateur or Enovit P).
- 5.** If the fermentation is sluggish or stuck, consider adding 100-200 ppm Fermocel P or Celloferm.

**CHAPTER FOUR**

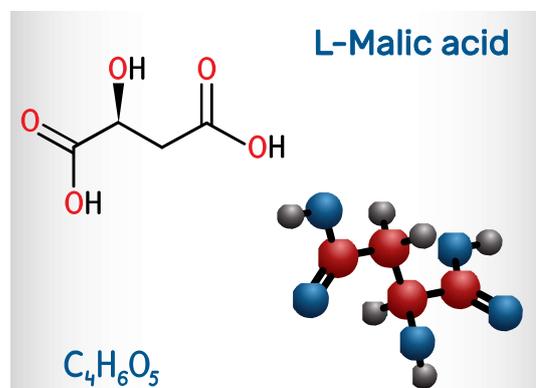
**ML Secondary  
Fermentation**

PRODUCT	TYPE	CHARACTERISTICS	PACKAGING
Malolact Acclimatée	Direct add bacteria	For clean and consistent ML fermentation	2.5 grams, 25 grams, 250 grams, 1 kg
Malolact Acclimatée 4R	Direct add bacteria	For complicated ML fermentations (high alcohol and high tannins)	2.5 grams, 25 grams, 250 grams
Malolact Fresh	Direct add bacteria	Fast and consistent ML fermentation	1 kg
Fermoplus Malolactique AF	Yeast derivatives	MLF nutrient	0.5 and 5 kg bags

## MALOLACTIC BACTERIA

### What is malolactic fermentation?

Malolactic fermentation (MLF) refers to the biological deacidification of wine under the action of bacteria. The transformation of malic acid leads to the formation of lactic acid, a weaker acid, which results in increased smoothness, roundness, and microbiological stability of wines.



MLF is generally carried out by a species of lactic acid bacteria: *Oenococcus oeni*. By inoculating with an AEB starter culture, the winemaker can reduce the risk of potential spoilage bacteria, promote the rapid start and completion of MLF, and encourage a positive flavor contribution.

### Malolact Acclimatée:

Highlights the typical aromas of the cultivar without the appearance of bitter or green nuances. It improves the taste profile of wines, enhancing roundness, fullness, and prolonged after taste sensations.

### Malolact Acclimatée 4R:

Direct add MLB, ideal for big red wines and harsh ML conditions: the selection has been mostly focused on having a strain resistant not only to harsh conditions ( pH: 3.2;

**Temperature:** 18 °C/64°F; Alcohol level: 14.5%; Total SO<sub>2</sub> 60 ppm) but also to high levels of tannins (TPI 80).

**Malolact Acclimatée F:**

Vigorous, single strain direct inoculum, selected to focus on the ability of the bacteria to complete the malolactic process in the shortest time possible. Malolact Acclimatée F has a noticeable tolerance towards low temperatures, sulfur dioxide, and high alcohol, and is intended to be added directly to the wines. One of the main selection goals of this strain has been the lack of biogenic amine production.

**\*Packaging:** only 1 kg.

**Frozen culture at -20°C.**

**Utilization:** remove selected Malolact bacteria from the freezer 30 minutes before use. Malolact bacteria works as a direct add.

**Dosage and packaging:** 10 ppm. Comes in pre-dosed packets of 2.5 grams, 25 grams, 250 grams and 1 kg.

**Shelf life and storage:** Malolact bacteria are stable for two years (with minimal loss of activity), when stored in a freezer (- 4-17°C / 25-1.4°F).



## MLB NUTRIENT

### **Fermoplus Malolactique:**

Nutrient targeted for bacteria. It helps the onset of MLF, improving nutritional conditions of the wine. It reduces lag-phase and time to MLF completion, resulting in cleaner wines.

**Utilization:** dissolve dose in wine to be treated, along with the dose of malolactic bacteria.

**Dosage:** 50-200 ppm. Higher dosage is for when used for co-inoculation.

Shelf life and storage: Fermoplus Malolactique is stable at room temperature for at least two years.

**Packaging:** 500 gram packs and 5 kg bags

	SIMPLE CONDITIONS	NOT SIMPLE CONDITIONS	DIFFICULT CONDITIONS	EXTREME CONDITIONS
Alcohol (%vol.)	<13	13-15	15-17	>17
pH	>3,4	3,1-3,4	2,9-3,1	<2,9
Free SO <sub>2</sub>	<8	10-12	12-15	>15
Total SO <sub>2</sub>	<30	30-40	40-60	>60
Temperature (°C)	18-22	Low: 14-18	Low: <14	Low: <10
		High: 18-24	High: >24	High: >29
Initial malic acid g/L	2-4	High: 4-5	High: 5-7	High: >7
		Low: 1-2	Low: 0,5-1	Low: <0,5

Factors and values that influence Malolactic fermentation.

### **What is co-inoculation?**

Co-inoculation is a technique that consists in co-inoculating a must with yeasts and malolactic ferments. It significantly accelerates the malolactic fermentation process. This time saving can be decisive for young wines, wines with high pH (>3.6), and can limit the risk of spoilage. To obtain a good success rate, it is important to avoid excessive sulfiting and use a low SO<sub>2</sub> producer yeast (see table at the beginning of yeast chapter).

## **HOW TO INCREASE BUTTERY (DIACETYL) FLAVOR**

- According to our research, additions of 1000 ppm of Citric acid in partially aerobic conditions can double the amount of diacetyl in the final wine.
- The bulk of the conversion will start after the Malic acid is all depleted and will be diminished by the presence of SO<sub>2</sub>. If diacetyl is desired, it is better to wait a few days after completions of MLF before SO<sub>2</sub> addition.
- Diacetyl is adsorbed by the lees. The practice of leaving wine on the lees diminishes Diacetyl concentration, both because the lees will adsorb it and because the cells of bacteria that are still viable will convert Diacetyl into acetoin. Adding products like AEB Super-mann, Elevage Glu, or Bâtonnage Elevage, can give the same impact of a good sur lies, without the risk of losing diacetyl.
- If diacetyl is desired, do not co-inoculate ML with yeast.
- A faster ML produces less diacetyl. For higher Diacetyl, play with the temperature and pH to ensure that the Malo-Lactic fermentation lasts about 2 weeks.



## **HOW TO BOOST ML BACTERIA BY PROPAGATION**

Direct-add bacteria can be added directly pouring the acclimated bag into the wine. Alternatively, they can be propagated with Reactivateur to increase population and efficiency:

1. Draw a small portion of the wine to be inoculated.
2. Use 100 liters (26 Gal) for 250 hL (6600 Gal).
3. Add 60 ppm of Fermoplus Malolactique.
4. Adjust pH to 3.5 – 4 and inoculate with the malolactic bacteria of your choice.
5. Maintain a constant temperature of 24°C/75°F for 24 hrs.
6. The next day that portion of wine will have a much more aggressive population to quickly start the ML process in the rest of the tank.



**CHAPTER FIVE**

**Enzymes for  
Wines & Ciders**

Applications	Enzyme	Type	Advantages
<b>White must Clarification</b>	Endozym Active	Granular pectinase	To break down pectins before cold settling
	Endozym E-Flot	Liquid pectinase for flotation	Fast acting for flotation
	Endozym Ice	Cold liquid pectinase	Pectinase not inhibited by cold temperature
	Endozym ICS 10 Éclair	High concentration liquid pectinase	Very high activity
	Endozym Micro	Liquid pectinase enzyme	High activity
	Endozym Muscat	Granular pectinase for difficult must	Side-activity to untangle pectins
<b>Aromatic cold maceration enzyme</b>	Endozym Cultivar	Pectinase plus Cellulase	It weakens the cell walls in the pulp facilitating aromas extraction
<b>Color enzyme</b>	Endozym Contact Pelliculaire	Pectinase plus Cellulase	Improves extraction from skins
	Endozym ICS 10 Rouge	high concentrated liquid enzyme	Very high activity maceration-color extraction
	Endozym Rouge Deep Skin	Concentrated liquid enzyme	High activity targeted to thick skins
	Endozym Rouge Light Skin	Concentrated liquid enzyme	Activity targeted to thin skins
<b>Aroma enhancement</b>	Endozym $\beta$ -Split	B-glucosidase	Varietal aroma release - terpenes
	Endozym Thiol	Liquid carbon-sulfur lyase	Varietal aroma release- thiols
<b>Maturation enzymes</b>	Endozym Glucapec	Glucanase/Pectinase	Degrades Glucans, improve filterability
	Endozym Antibotrytis	Pectolitic enzyme with high secondary activity and $\beta$ -glucanase	Treatment of Botrytis-affected grapes
<b>Microbial Control</b>	Lysocid W	Lysozyme	damages or kills LAB
<b>Specialty enzymes</b>	Endozym TMO	Pool of enzymatic activities for Flash-Détente technology and Thermo	For the clarification of heat extracted musts.
	Endozym PL	Purified Pectin lyase	Depectinization without methanol production
	Endozym Pectofruit USP	Enzymatic preparation for the treatment of apple juices	Apple juices difficult to be depectinized
	Endozym Pectofruit , Pectofruit Plus	Pectinases for increasing yield and help clarification of cider and perry	Insures total degradation of the fruit structure before pressing
	Endozym Citrus Cloudy	Concentrated and purified pectolitic enzyme	reduce viscosity and to stabilize the cloudy matter in citrus juices
	Endozym Alphamyl FJ	$\alpha$ -amylase enzyme for the clarification of cider and perry	To avoid possible starch related haze and to facilitate ultra filtration

Pectinases activity (U/g)		Cellulases and hemicellulase (U/g)		Rhamnosidase-arabinosidase (U/g)	$\beta$ glucans activity (U/g)	Other activities
PL	PG	PE	CMC	ARA	BGX	
•	•	•	•	N/D	N/D	N/D
•	•	•	N/D	•	N/D	N/D
•	•	•	•	N/D	N/D	N/D
•	•	•	•	N/D	N/D	N/D
•	•	•	•	N/D	N/D	N/D
•	•	•	•	•	•	N/D
•	•	•	•	N/D	N/D	$\beta$ -glucosidase
•	•	•	•	N/D	N/D	N/D
•	•	•	•	N/D	N/D	N/D
•	•	•	•	•	N/D	N/D
•	•	•	•	•	N/D	N/D
•	•	•	•	N/D	N/D	$\beta$ -glucosidase
•	N/D	N/D	N/D	N/D	N/D	$\beta$ -glucosidase; Sulfur lyase
•	•	•	•	N/D	•	N/D
•	•	•	N/D	•	•	N/D
N/D	N/D	N/D	N/D	N/D	N/D	Lytic enzyme
•	•	•	•	•	N/D	N/D
•	N/D	N/D	N/D	N/D	N/D	N/D
•	•	•	•	N/D	N/D	N/D
•	•	•	N/D	N/D	N/D	N/D
•	•	•	N/D	N/D	N/D	N/D
•	•	•	N/D	N/D	N/D	N/D
N/D	N/D	N/D	N/D	N/D	N/D	amylase

### **Why is it important to choose the right enzyme?**

Enzymes are proteins present both in the skin and in the pulp (pectinases and glycosidases) of the grapes, which speed up the vinification process. They act by lowering the reactions' activation energy at different stages of the process. Each enzyme affects specific substrates: that is why it is very important to choose the right enzyme at the right moment.



Why is it important to choose the right wine enzyme? Scan the code to learn more.

AEB enzymatic preparations are the result of extensive research and combine a mix of activities aimed at guaranteeing each winemaker the desired result. A complete range of easy-to-use enzymes is designed to enhance and complement what is already naturally present in the grapes, responding to precise needs and promptly solving problems throughout the entire winemaking process.

### **The main activities of AEB enzymes are highly specific and directed towards:**

- Pectins: Pectinlyase (PL), Polygalacturonase (PG) and Pectinmethylesterase (PE).
- Hemicellulose: Cellulase (CMC).
- Beta-glucosidase for glycosides compounds, carbon-sulfur lyase for thiols.
- Glucans: Beta-glucanase.

**Aromatic expression enzymes:** release the aromatic precursors making the compounds volatile (terpenes, thiols), thus helping to enhance aromatic expression.

### **What is the interest of using $\beta$ -glycosidases?**

These enzymes catalyze the hydrolysis of glycosidic bonds. They have a role in the release of aromatic molecules of the terpenol family and C13-norisoprenoids. Suppressed by glucose, these enzymes must be used towards the end of alcoholic fermentation. These enzymes are generally used at a dose of 20-30 ppm. Their action can be stopped by a light binding with Bentogran (30-100 ppm).

**Endozym  $\beta$ -Split:**

Granulated beta-glucosidase specific for terpenes release and aroma enhancement.

**Usage:** Dissolve directly in 20-30 parts of non-sulfurized must or in demineralized water, then add either mid-way through the fermentation or to the finished wines before bentonite addition.

**Dosage:** 20-50 ppm depending on contact time, temperature and SO<sub>2</sub> content. The activity of Endozym  $\beta$ -Split is reduced by high sugar and low temperatures, so dosage must be increased accordingly.

**Shelf life and storage:** Endozym  $\beta$ -Split is stable at room temperature for at least two years, with a loss lower than 5% per year starting from the third year.

**Packaging:** 500g vacuum-sealed cans.

**Endozym Thiol:**

Liquid carbon-sulfur lyase to favor the conversion of Cys-3-MH and Cys-4MMP into 4MMP (4-Mercapto-4-methyl-pentan-2-one) and 3MH (3-mercaptohexan-1-ol) reminiscent of grapefruit, passion fruit, and box-tree.

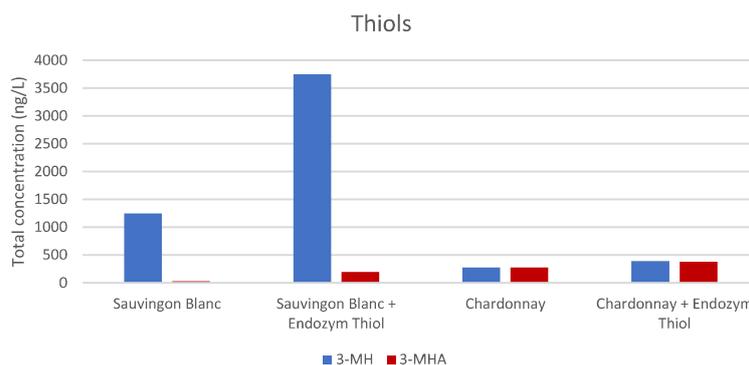
**Usage:** Add to the fermenting tank halfway through fermentation. Use Eleveage Glu to protect the newly formed aromatics from oxidation.

**Dosage:** 20-40 ppm depending on time, temperature, and SO<sub>2</sub> content.

**Shelf life and storage:** Endozym Thiol should be stored at 5°C/40°F for a period not longer than 24 months.

**Packaging:** 1 liter bottles





The varietal thiols 3-mercaptohexanol (3-MH) and 3-mercaptohexyl acetate (3-MHA) are well known impact aroma compounds in Sauvignon Blanc and other white wines, giving 'tropical', 'box hedge', 'grapefruit' and 'passionfruit' aromas. The graph shows the increased concentration (ng/L) of thiols compounds (3-MH; 3MHA) in Sauvignon Blanc and Chardonnay after addition of 5 ml/hL of Endozym Thiol at the beginning of fermentation. Tondini et al. (2019). The Effects of Pre-fermentative Additions on Yeast Volatile Aromas and Thiols in Sauvignon Blanc and Chardonnay. ASEV/ AWITC.

**Clarification enzymes** degrade pectins and grape cell wall components (hemicellulose), shortening settling time and increasing the yield of must free run juice. As a consequence, a cleaner must is obtained and the wine will have cleaner aromas and less unstable proteins, and it will be easier to filter. Cellulases and hemicellulases ensure the degradation of a large number of cell wall constituents.

**Endozym Active:** Granular pectinase enzyme to be used to break down pectin before must settles or flotates. The activity of Endozym Active is reduced by lower temperatures, thus guaranteeing good contact time with the must before refrigeration.

**Endozym Muscat:** Granular pectinase for must settling/flotation of "harder to clarify" varieties like Muscat, Gewürztraminer, Malvasia, Müller Thurgau. These grapes are all characterized by their high content in ramified pectin. Secondary activities such as arabanase and rhamnosidase are key ingredients that allow Endozym Muscat to quickly remove pectin in the most challenging varieties.

**Usage:** dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.

**Dosage:** 20-40 grams per ton of grape depending on contact time, temperature and SO<sub>2</sub> content.

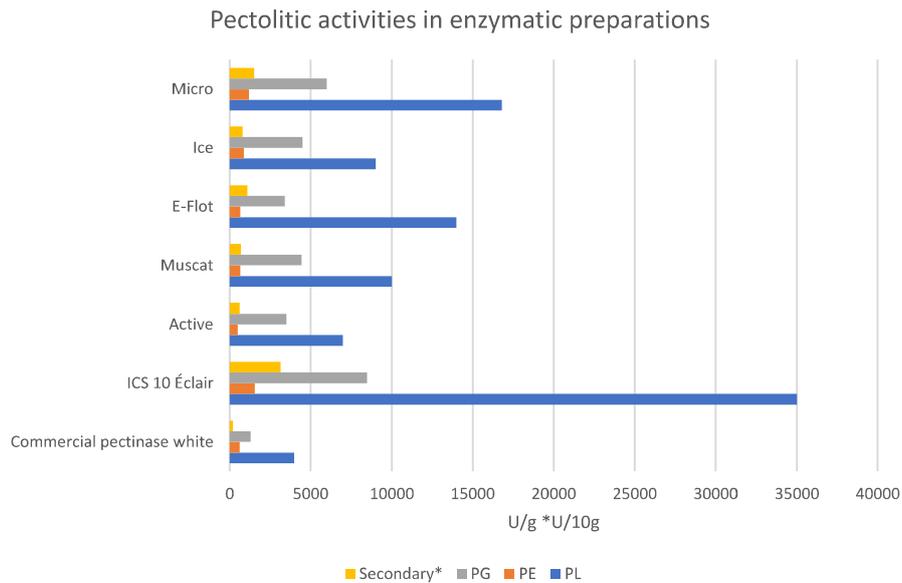
**Shelf life and storage:** granular Endozym is stable at room temperature for at least two years, with a loss lower than 5% per year starting from the third year.

**Packaging:** 500g vacuum-sealed cans.

**Endozym E-Flot:** reformulated liquid pectinase enzyme for must clarification through flotation at a temperature between 55°F and 59°F (12°C and 14°C) to thoroughly de-pectinized and prevent the fermentation from starting.

**Dosage:** 5-10 ml per ton of grapes (5.75-11.5 grams per ton). \*

**Packaging:** 10 kg pales.



Pectinases including pectin lyases (PL), pectin methylesterases (PME) and polygalacturonases (PG). Pectin is a major constituent of the plant cell wall. Pectin lyases break down the pectin chain into two methylated galacturonic acids. The activity of the PME will release the methyl group of these acids, which will then be degraded by the PG. Commercial pectinase formulations include several linkage-specific secondary activities that (collectively) bring about a more complete degradation of grape tissue. The graph shows the incidence of pectolytic activities in the enzymatic preparations.

**Endozym Ice:** liquid enzymatic preparation, specifically formulated for maximizing the extraction of varietal aromas and assist in the clarification of musts obtained by cold maceration.

**Dosage:** 2-6 ml per ton of grapes (about 2.3-6.9 grams per ton).\*

**Packaging:** 1 Kg plastic bottle.

**Endozym Micro:** concentrated liquid pectinase enzyme. It accelerates the clarification processes of musts.

**Dosage:** 2-6 ml per ton of grapes (about 2.3-6.9 ml per ton).

**Endozym ICS 10 Éclair:** high concentration liquid pectinase enzyme. Its clarification activity significantly surpasses that of any other enzyme on the market. The higher concentration guarantees a longer shelf life than any other liquid product and makes the package very easy to store in a small, refrigerated space.

**Dosage:** 1.5 to 5 ml per ton of grapes (about 1.7-5.75 grams/ton). \*

**Packaging:** 250 ml & 1kg plastic bottle.

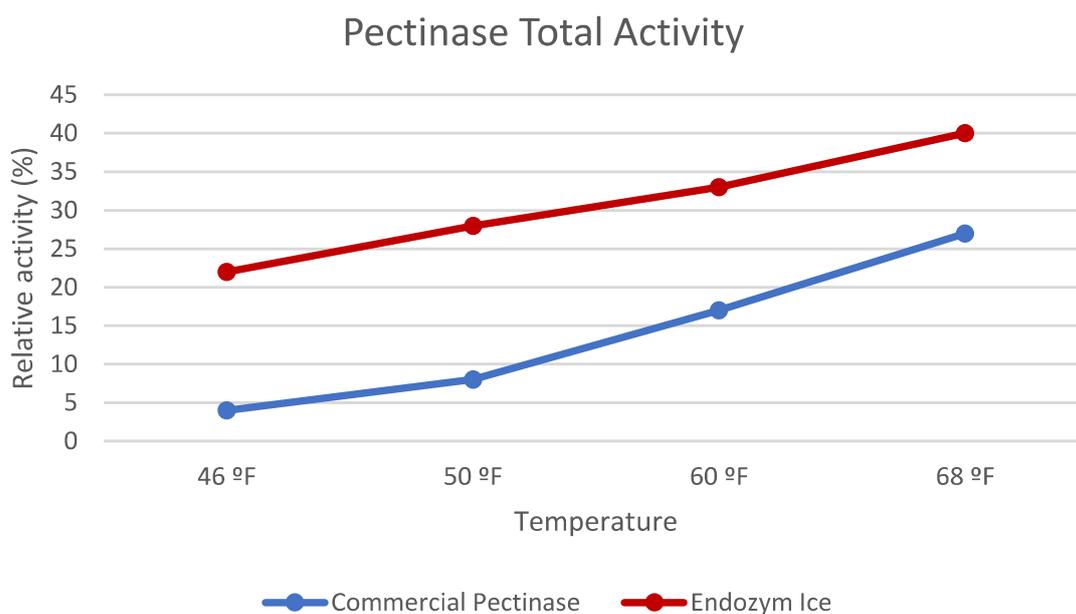


**Usage:** Dilute directly in 20-30 parts of non-sulfurized must or in demineralized water and add to must or directly onto the grapes.

**\*Dosage:** The dosages vary according to the grapes to be treated or the vinification technology applied. Treatments at low temperature and musts with a high percentage of pectins and suspended solids require the higher end of the dosage range. Also, pH's lower than 3.2 require higher dosages.

**Shelf life and storage:** liquid Endozym should be stored at 40°F/5°C for a period not longer than 24 months.





The factors impacting enzyme activity include pH, temperature, and contact time. Decreases in pH, temperature, and/or contact time, along with increases in SO<sub>2</sub>, may impact enzyme effectiveness. The graph shows the effect of low temperatures on commercial pectinase vs Endozym ICE.

### What is the advantage of enzymes for settling or flotation?

After extraction of the juices during pressing, the negatively charged pectins form a protective layer around the positively charged solid particles, keeping them in suspension. The degrading action of the pectinases exposes these complexes which form larger particles and sediment.

**Maceration enzymes** guarantee higher extraction efficiency, thus reducing maceration time. As the walls of the plant cells contain approximately 30% pectins, in addition to a more complex structure, maceration enzymes generally perform specific complementary activities to extract more juice, aroma precursors, and polyphenols in the musts, resulting in larger quantities of wine. The must displays a higher permeability, a better yield, and a fast reduction of viscosity and sedimentation, which in turn result in more appreciated wines at taste.

**Endozym Cultivar:** granular enzyme for cold maceration of white grapes. Endozym Cultivar is best used at the press or added to the must prior to cold settling. It weakens the cell walls in the pulp facilitating aromas extraction. It also presents a very high  $\beta$ -Glucosidase activity that releases terpenes from sugars and provides a PL and PG

action comparable to enzymes used for must settling and yield. The enzyme should be added directly on the truck/gondola or into the receiving line, thus ensuring good contact time before refrigeration.

**Packaging:** 500g vacuum-sealed cans.

**Endozym Contact Pelliculaire:** granular maceration/color-extraction enzyme. It facilitates the dissolution of anthocyanins and improves tannin extraction from skins, contributing to color stabilization. This pectolytic enzyme pool with natural secondary cellulase and hemicellulase activities, speeds-up the color extraction process, decreases maceration time, and consequently prevents the extraction of unwanted bitter tannins.

**Packaging:** 500g vacuum-sealed cans.

**Usage:** dilute directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to the grapes/must.

**Dosage:** 20-40 grams per ton of grapes depending on contact time, temperature and SO<sub>2</sub> content.

**Shelf life and storage:** Endozym is stable at room temperature for at least two years, with a loss lower than 5% per year starting from the third year.

### **WHAT ARE THE FACTORS INFLUENCING ENZYMATIC ACTIVITY?**

- Temperature: high and low temperature > 60°C/140°F and < 4°C/40°F.
- pH lower than 3.2.
- Free SO<sub>2</sub>.
- Sugar content: glycosidases (>50 g/L).
- Bentonite: it adsorbs proteins and therefore inactivates enzymes.
- Oenological tannins.

Precaution needs to be taken in order to avoid contact between the enzyme and other oenological additives (in particular bentonite and SO<sub>2</sub>). Lower than optimum conditions always require higher enzymatic dosage or prolonged enzymatic activity.

**Endozym ICS 10 Rouge:** high concentrated liquid maceration and color extraction enzyme. It is more practical to store and ship, avoiding the risk of exposing it to the heat, which would quickly deteriorate it. It contains pectinase and secondary activities (cellulase, polygalacturonase and hemicellulase) enabling rapid color and phenolic extraction. Wines obtained from grapes treated with Endozym ICS 10 Rouge will be more structured and complex.



**Dosage:** 1 to 3 ml per ton of grapes (1.15-3.45 grams per ton). \*

**Packaging:** 250 ml & 1kg plastic bottle.

**Endozym Rouge Deep Skin:** is an ideal enzyme for processing varieties that have thick skins. If managed incorrectly, Thick skin varieties can lead to wines that have a higher concentration of lees, hence presenting additional difficulties during pressing. Endozym Rouge Deep Skin allows winemaker to maximize the concentration of polyphenolic substances, noble skin tannins, and varietal aromas. It will also reduce maceration times and the need for excessive pump overs, commonly identified as the main causes behind the extraction of bitter tannins.



**Dosage:** 10-20 ml per ton grapes.

**Packaging:** 1kg plastic bottle.

**Product available only on special order.**

**Endozym Rouge Light Skin:** The results obtained with Endozym Rouge Light Skin show that this is an ideal enzyme for processing varieties that have fine/thin skins. If managed incorrectly (wrong preparation and/or dose causing over extraction), fine/

thin skins can lead to wines that have a higher concentration of lees, hence presenting additional difficulties during pressing. Less secondary activities are needed to extract from light skins and this balanced formulation ensures a good extraction of color and minimal solids production.

**Dosage:** 10-20 ml per ton of grapes.

**Packaging:** 1kg plastic bottle.

**Usage:** at the first pump over, right before fermentation starts, and when the temperature is above 60°F-18°C. The product should be diluted in 20-30 parts of sulfur-free must or in de-mineralized water. Higher doses must be used for grapes with low pH and cultivars, or vintages for which the extraction of color might be particularly difficult.

**Shelf life and storage:** store at 5°C/40°F for a period of no longer than 24 months.

**Product available only on special order.**

**Maturation enzymes** are ideal to obtain a rounder and more complex wine - especially thanks to the release of aromas and mannoproteins during the aging phase-, to improve filterability, and to increase the shelf-life of the wine.

## **WHAT ARE THE BENEFITS OF BETA-GLUCANASES?**

These enzymes degrade glucans, which are the main compounds of the fungus wall, including wine making yeasts of the genus *Saccharomyces*. Traditionally, beta-glucanases were used on botrytized grapes to improve the filterability of wines. Currently, these enzymes are experiencing renewed interest, together with maturation on lees, in order to accelerate autolysis phenomena. These enzymes are generally used at a dose of 20-40 ppm.

**Endozym Glucapec:** enzyme to facilitate filterability in wines rich in glucans, like the ones obtained from *Botrytis* infected grapes. The  $\beta$ -glucanase is also used for the qualitative improvement of the wines kept on their lees. In fact, this treatment accelerates the processes of cell-autolysis of the yeast. Autolysis brings in solution amino acids, nucleic acids, and mannoproteins, improving the mid palate, the redox potential, the aromatics, and even the tartaric stability of wines.

**Usage:** Dilute in 20-30 parts of wine with low SO<sub>2</sub> or de-mineralized water. Add direct-

ly to the wine. The addition must be carried out at the end of the alcoholic fermentation since the enzyme is strongly inhibited by the action of the yeasts. Ideally, this enzyme should be utilized between 60 and 78°F (16-24 °C) and is never to be used in conjunction with bentonite.

**Dosage:** 20-40 ppm (lower dosages are best with higher temperatures).

**Shelf life and storage:** Stable at room temperature for 3 years.

**Packaging:** 500g cans.

**Endozym Antibotrytis:** prevents polyphenols oxidation by eliminating tyrosinase-laccase enzymes and prevents plugging by removing glucans. The treatment with Endozym Antibotrytis is decisive in musts obtained by grapes heavily attacked by grey mold, which is responsible for problems which cannot be solved either by sulfur dioxide or by other technological solutions. enzymes.

**Usage:** Dilute directly in 20-30 parts of non-sulfurized must or in de-mineralized water and add to must or wine. To guarantee pectin hydrolyzation and color extraction, Endozym Antibotrytis should be used in association with normal clarification or color extraction.

**Dosage:** 30-50 grams per ton of grapes or 200-400 ppm in wine. Treatments of musts or wines with a high infection, low temperature and high sugars need the higher dosages.

**Shelf life and storage:** Endozym Antibotrytis is stable at room temperature for at least two years, with a loss lower than 5% per year starting from the third year.

**Packaging:** 500g vacuum-sealed can.



**Microbial stability enzymes** are added to the juice or wine to prevent contamination or malolactic fermentation to guarantee greater freshness, higher quality, and maximum filterability.

**Lysocid W:** lysozyme enzyme is naturally obtained from selected egg albumin, which has the capacity to breakdown lactic cellular walls. It helps to degrade the cell walls of gram-positive bacteria such as Oenococcus, Pediococcus and Lactobacillus. It is not effective against gram-negative bacteria like Acetobacter and has no effect on yeast.

**Usage:** dissolve 1:10 ratio of Lysocid W in water, juice, or wine, and add uniformly to musts or wines. Do not treat with bentonite or other fining agents for 24 hours after addition to avoid inactivation of the enzyme.

**Dosage:** to prevent Lactobacillus in grapes: 100-250 ppm. To stabilize Lactobacillus during slow or stuck fermentation: 250-400 ppm.

**Shelf life and storage:** 2 years stored in cold temperature in a non-humid environment.

**Packaging:** 1kg packs

## **SPECIALTY ENZYMES**

### **Enzymes for Flash-Détente Technology and Thermo.**

**Endozym TMO:** liquid pool of enzymatic activities for clarification of heat extracted musts. It is characterized by strong secondary activities which are able to intervene on pectic chains present in the skin. These molecules heavily interfere with the brightness of the processed must and are usually harder than normal to degrade. Endozym TMO displays optimal temperatures for grapes coming out of thermo and is ideal to remove clogging pectins and polysaccharides.

**Usage:** Dilute directly in 20-30 parts of must, to which no sulfur has been added, or demineralized water. The product should be used immediately after the thermal treatment and after temperature has lowered under 104°F/40°C.

**Dosage:** from 20-40 ppm.

**Shelf life and storage:** can be kept for two years in the original sealed packaging and at temperatures below 50°F/10°C.

**Packaging:** 1 kg bottles and 10 kg pales

## **ENZYMES FOR THE CLARIFICATION OF JUICES**

**Endozym PL:** is an enzymatic preparation which only contains PL. This enzyme is purified via molecular separation from PE and PG, making it fast and unable to produce methanol.

**Dosage:** approximately 10 ml per ton depending on conditions.

**Endozym Pectofruit USP:** is utilized on direct or pre-concentrated fruit juices (12-16°Brix) in order to enable pectin degradation and, therefore, to facilitate clarification by means of a quick viscosity decrease. Endozym Pectofruit USP is rich in secondary activities (including macerating activity, mainly xylanase).

**Dosage:** 30 ppm.

**Endozym Pectofruit and Pectofruit plus:** ultra-concentrated enzymatic preparations, specifically formulated for the treatment of macerated fruits before pressing. AEB realized this pectolytic enzyme with a particularly high content in pectinlyase (PL) for the total degradation of the fruit structure before pressing. It can be used in fruit juices and grape musts as a generic pectinase.

**Dosage:** 20-50 ppm.

**Endozym Alphamyl FJ:** high concentration alpha-amylase to degrade and liquify starch faster, facilitating fining in fruit juice, especially apples. In fact, although pectins are the main substance responsible for cloudiness of apple juice, another potential contributor to the haziness is starch. At the beginning of the harvest season, unripe apples contain as much as 15% starch and up to 5% starch may be present in juice after milling and pressing. The following problems may occur if starch is present: slow filtration, membrane fouling, gelling after concentration, and post concentration haze.

**Dosage:** 20-50 ppm.



**Endozym Citrus Cloudy:** is an enzymatic preparation, specifically processed for the production of cloudy and stable citrus juices with reduced viscosity. It is mainly formulated with PG activity and only processes certain links yielding a juice that is less viscous but still cloudy. It is especially suited for making sure that an excessive quantity of calcium pectate is not present to avoid haze settling. It is characterized by stable activities at low pH values.

**Dosage:** for grapefruit or orange juice 80-150 ppm for 30-45 minutes at optimal conditions. Lemon juice: 100-200 ppm for 30-45 minutes at optimal conditions.

**Advantages:**

- Partial hydrolysis of the pectin
- Viscosity reduction
- Optimal juice extraction
- Maintenance of the cloudy matter's stability.

**Usage:** Dilute the preparation till 10 times its volume in demineralised water. The addition is carried out directly in the juice with the help of a dosing pump placed at the exit of the press or on the pre-concentrated juice directly in the tank.

**Storage:** Store in a cool dry place, away from direct sunlight and heat.

**Packaging:** 1.5 and 25 kg.

**CHAPTER SIX**

**Tannins**

PRODUCT	DESCRIPTION	USAGE				
		Fermentation	Maturation	Finishing	Gallic	Ellagic or Hydrolyzable
Fermotan CB	Specific for optimal color stabilization for Cabernet, Merlot, Toroldego, Montepulciano, Barbera.	•				
Fermotan AG	Specific for optimal color stabilization for Aglianico, Nero d'Avola, Primitivo, Zinfandel, Malbec, Tempranillo, Syrah.	•				•
Fermotan SG	Specific for optimal color stabilization for Pinot Noir and Sangiovese	•				•
Fermotan/ Fermotan liquid	Sacrificial tannins for color stabilization & structure	•			•	•
Fermotan Blanc	Ellagic tannin for structure and oxygen protection	•			•	•
Gallovin/Gallovin liquid	Tannin from gallnuts to protect from oxygen and to neutralize laccase from Botrytis	•			•	
Protan AC	Acacia derived tannin for aging structure and color stabilization	•				
Protan Q BIO	Quebracho derived tannin for aroma and color stabilization	•				
Protan Bois	Quebracho derived tannin for aging structure and color stabilization	•				
Tanethyl Effe	Optimal for coal soak color stabilization	•				•
Ellagitan Chene	Powdery oak tannin to elevate fruit expression		•			•
Ellagitan Rouge	Tannin for the treatment of red wines	•	•			•
Ellagitan Extreme	Powdery oak tannin to elevate fruit and spices expression		•			•
Ellagitan Refill	Un-toasted oak tannin to re-establish the redox potential		•			
Protan Malbec	Nutty and structured grape-seed derived tannin		•			
Protan Peel	Liquid grape-skin derived tannin	•	•			
Protan Pepin Oxilink	Seed proanthocyanidinic tannin for young wines		•			
Protan Raisin	"Velvety" and structured grape-skin derived tannin		•	•		
Tanethyl	Activated (ethanal bridge) and fast polymerizing for color stabilization. Ideal for MOX		•			
Taniblanc	Strong antioxidant, highly reactive, ellagic tannin	•	•			•
Taniquerc	Ellagic tannin from french oak with chocolate, moka nuances		•			
EB Berry Mix	Liquid oak tannin with high vanilla and sweet sensations from the oak			•		•
EB Fruit Reserve	Liquid oak tannin with nuances of maple syrup, caramel and vanilla			•		•
EB Goud-Ron	Liquid oak tannin with high vanilla and nuances of "tar", reminiscent of old fashion Rhône-style wines			•		•
EB XO	Liquid oak tannin with nuances of Syringaldheyde (toasty), spices and vanilla.			•		•
Ellagitan Barrique Liquid	Liquid oak tannin with nuances of vanilla, whisky lactone and coconut			•		•
Ellagitan Barrique Blanc	Ellagic tannins and arabic gum that has been developed to add volume and light oak nuances, without affecting the color of white wines			•		•
Ellagitan Barrique Rouge	Powdery oak tannin with nuances of vanilla, Whisky Lactone and coconut			•		•



### **What are the functions of adding tannins during winemaking?**

- Improve mouthfeel sensation and wine aroma/ flavor.
- Precipitate proteins.
- Scavenge oxygen and help prevent oxidation.
- Inhibit laccase activity.
- Stabilize red wine color.
- Enhance the aging potential.
- Decrease reductive off-flavors.



### **FERMENTATION TANNINS:**

The addition of these enological tannins has the primary role of 'sacrificial tannins'. If added at the beginning of vinification, these tannins interact with reactive proteins and other grape components forming an insoluble compound and precipitating out into the lees. Because these enological tannins are prone to these reactions, natural grape tannins are protected to combine with grape anthocyanins and form polymeric pigments, which preserve color and have more stability.

**Fermotan and Fermotan Liquid:** are vinification tannins with antioxidation and color stabilization properties. The synergy among the 3 classes of tannins exerts a triple protective action towards the anthocyanins. This product is available both in liquid and powdered form.

**Dosage:** average dosages in red must range 120-960 ppm or 10-80 ml/hL .

**Packaging (Powder):** 1 kg packets, 15 kg bags.

**Packaging (Liquid):** 5 kg bottles, 25 kg drum.

**Gallovin and Gallovin Liquid:** sacrificial tannin, highly reactive with protein. It protects from the risks of oxidation, including botrytis infection. Gallovin is a colorless and odorless product which will not affect wine flavors, but will reduce the needs for antioxidants such as SO<sub>2</sub> and ascorbic acid.

**Dosage:** Average dosage range in musts is 120-360 ppm or 10-30 ml/hL Add about 200 ml per ton of grapes.

**Packaging (Powder):** 500 g and 5 kg bags Packaging liquid: 25 kg pales.

**Fermotan Blanc:** stops the progressive darkening of oxygen-rich white musts, without increasing their color, adds an "oaky" structure and preserves the aromatic freshness for a longer period. Fermotan Blanc allows winemakers to reduce significantly SO<sub>2</sub> addition.

**Dosage:** 50 to 400 ppm in white musts.

**Packaging:** 1 kg packets

**Tanéthyl Effe:** tannin for color stabilization in cold soak and for rosé wines. The condensed tannin fraction provides the juice (or fermenting wine) with the ethanal bridges that would otherwise not be present due to low ethanol concentration. Tanéthyl Effe also contains simple ellagic tannins that





give smoothness and promote color stabilization when fermentation begins.

**Dosage:** rosé wines: 40 to 120 ppm. Red wines: 120 to 360 ppm.

**Packaging:** 1 kg packets.

**Utilization:** Mix 1:10 in a separate tub with warm water (95°F/35°C) and then add to the grapes or to fermenting must during pump over.

**Shelf life and storage:** it can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place

## **HOW TO MAKE WINE WITHOUT SULFIDES**

Sulfites, thanks to their antioxidant, antioxidantase, and antiseptic properties, contribute to the production of fresh and clean wines. The total elimination of sulfites is often impossible, but reduction in their use during the entire process can be achieved through the combination of different winemaking practices and oenological products.

AEB developed the following products for low SO<sub>2</sub> winemaking:

**PRIMAFLORA VB/VR:** *M. pulcherrima* yeast, effective in controlling the unwanted flora at the beginning of the fermentation.

**GALLOVIN:** sacrificial gallic tannin to protect from dissolved oxygen and inhibit enzyme-made oxidation.

**ELEVAGE GLU:** specific inactivated yeasts rich in glutathione to extend wine shelf-life and protect against oxidation.

**CHITOCCEL:** chitosan for microbial spoilage control and to limit oxidation reactions by chelating metals in finished wines.

## **AEB INTRODUCES: A NEW CONCEPT OF FERMENTATION TANNINS**

### **Varietal Specific Tannins**

Color, or better anthocyanins, are polyphenolic compounds present in red grapes located in the vacuoles of the skin cells and, in tannier varieties, also in the pulp. Five forms of anthocyanins have been identified with different stability in wine: disubstituted forms (cyanidin and peonidin), characterized by low stability; trisubstituted forms (delphinidin, petunidin, malvidin) with medium stability; and acylated forms, which are the most stable. AEB R&D labs, in collaboration with the University of Turin, studied which tannin addition maximizes the color stability for each varietal. The outcomes of the experiment showed how different anthocyanins profiles request different compounds to prevent color loss. The results suggest how to obtain a significantly stronger color intensity and more lively color hues. Based on genetic maps that cluster varieties with similar anthocyanins profiles, AEB has formulated different tannin blends to target color stability for varieties with similar characteristics.

**Fermotan CB:** is a mix of proanthocyanidinic tannins obtained from grape skins, grape seeds, and quebracho. It helps to stabilize anthocyanins and consequently fix the color in varieties with an anthocyanin profile like that of Cabernet, Merlot, Toroldego, Montepulciano, Barbera. It is best to use it from the earliest stages of vinification.

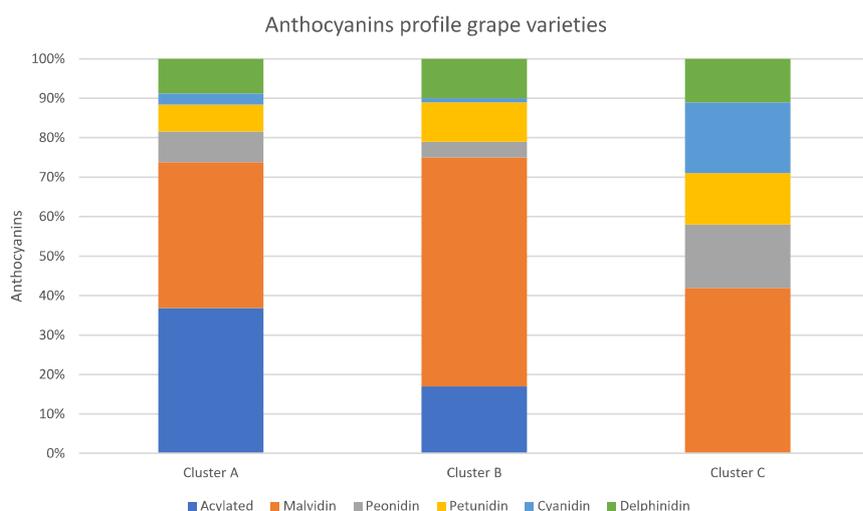
**Fermotan AG:** is a balanced blend of wood and skin proanthocyanidins and ellagic tannin extracted from oak, with a slightly astringent flavor with boisé notes. It helps reach the correct amount of reactive proanthocyanidins to stabilize the color from the early vinification stages. It is best to use it from the first vinification stages for Aglianico, Nero d'Avola, Primitivo, Zinfandel, Malbec, Tempranillo, Syrah.

**Fermotan SG:** is a balanced mix of ellagic and wood proanthocyanidinic tannins. It has a soft taste. It helps color preservation and its stable evolution from the early vinification stages. It is best to use it from the first vinification stages for Sangiovese and Pinot Noir.

**Dosage:** From 60 to 400 ppm.

**Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place.

**Packaging:** 1 kg net/ 5 kg net bags.



AEB R&D labs, in collaboration with the University of Turin, conducted a detailed analysis to characterize the typical profile of anthocyanins of a good and variate selection of grapes, clustering them into three different groups according to similarities found in their pigments content.

## **MATURATION TANNINS**

Maturation tannins play a fundamental role in the development of wine throughout the cellaring period and in ensuring a correct aging of the wine. They are highly reactive towards oxygen and therefore help tune oxidation and protect/remediate against excessive exposure during the storage period, as well as adding oak aromas, flavor and mouthfeel to wines.



**Ellagitan Extreme:** extracted from toasted American oak staves, it has sweet notes with hints of licorice, cloves, pepper, and chocolate, along with very high vanillin content. It is often used in red wines to hide vegetal characters and to open them up, helping to release a bouquet richer in cherries and red fruits. It adds a round and complex structure that is never bitter or astringent, even at high dosages, in both red and white wines. When used in complex and fruity red wines, like Shiraz, Cabernet Sauvignon, and Merlot, expect the fruit to be enhanced and integrated with sweet nuances of chocolate and licorice. When used in big whites like Chardonnay and Viognier, it gives a longer finish and keeps the wine fresh and fruity.

**Dosage:** 120-500 ppm.

**Packaging:** 500g packets.

**Ellagitan Rouge:** is a preparation based on ellagic and proanthocyanidic tannin extracted from toasted oak and quebracho. Using Ellagitan Rouge during crushing and fermentation will assist in preserving the gustative and olfactory freshness of red wines and is ideal for stabilizing color and reducing the risk of unwanted orange-brown hues in the finished wine. Ellagitan Rouge may also be used during maturation and refinement to stabilize color and retain freshness.

**Dosage:** 50-600 ppm.

**Packaging:** 5 and 25 kg net bags.

**Ellagitan Refill:** liquid tannin derived from un-toasted oak. It reintegrates the ellagic fraction lost in used barrels, enabling them to be re-used for a longer time without losing their ability to promote optimal wine aging. It can be used to increase structure or to optimize micro-oxygenation and cure the presence of reductive odors in tanks.

**Dosage:** Average dosages range 120-720 ppm or 10-60 ml/hL.

**Packaging:** 1 kg bottles and 25 kg pales.

**Taniblanco:** derived from prized oak, it enhances fruit expression and oxidation resistance in white and rosé wines. Its antioxidant activity protects the wines during the entire period of bottle maturation and reduces the need for chemical preservatives, like sulfur and ascorbate. The use of Taniblanco, even from the early stages of white must processing, produces straw-yellow wines with youthful and intense varietal characterization. It balances wine structure, eliminating the coarseness caused by an excessive content of proanthocyanidic tannins. It is also recommended to minimize reduction problems.

**Dosage: red wines:** 120-500 ppm ; rosé wines 120–250 ppm; white wines 60-120 ppm.

**Packaging:** 1 kg packets.

**Taniquerc:** derived from toasted French oak, it highlights the structure of red wines. It is also very efficient in removing reduction. If used with micro-oxygenation, Taniquerc promotes a violet color, fragrance and taste, typical of barrel-matured wines. It also prolongs the aromatic persistency and the aftertaste of wines, and increases the efficiency of used barrels.

**Dosage:** 120-500 ppm.

**Packaging:** 1 kg packets and 15 kg bags.

**Protan AC:** condensed tannin from Acacia. Its main characteristic is to bind directly to anthocyanins and the tannins of the grape with a process of polymerization. If added during the mashing process, it preserves the polyphenolic compounds from the action of the oxygen. The peculiarity of this product is its great softness in the mouth, which places it closer to ellagic tannins than to proanthocyanins.

**Dosage:** 50 to 400 ppm.

**Packaging:** product available upon request in 1 and 5 kg bags.



**Protan Q BIO:** organic quebracho tannin which, although extracted from wood, has the same chemical nature of a condensed tannin. Added early in the fermentation cycle, this tannin combines with proteins and other grape components, and precipitates out into the lees. Thanks to these sacrificial tannins, natural grape tannins are preserved and are able to combine with grape anthocyanins to create optimally stable color.

**Dosage:** 100 to 500 ppm.

**Packaging:** product available upon request in 5 kg bags.

**Protan Bois:** proanthocyanidinic tannin extracted from Quebracho wood. Mostly utilized in red wines that need a stronger "structure-boost" on a budget, it strengthens and amplifies the tannin structure, stabilizes the color, and reverses the oxidation process adsorbing aldehydes and port-like odors. It needs time to integrate (about 30-60 days depending on dosage).

**Dosage:** 50-500 ppm. Because of the powerful structure of this tannin, it is recommended to wait 15 days for full integration and for optimal results.

**Packaging:** 1kg and 5kg packets.

**Protan Malbec:** is a powdered proanthocyanidinic tannin extracted from Malbec seed. It gives red wines a sweet but strong backbone structure and color stability.

In white wines, a small addition goes a long way in protecting from oxygen, building volume, and especially enhancing crispness. For this reason, it is also recommended to fix "flat" and "doughnut" white and rosé wines.

**Dosage: Whites:** 30 to 120 ppm. Reds: 120-400 ppm.

**Packaging:** 500 gram packets.

**Protan Pepin Oxilink:** seed tannin obtained from over-ripe, “crunchy” and “nutty” seeds from the Burgundy area of France. It improves the structure and color stability of red wines. In white wines, a small addition goes a long way in protecting from oxygen, building volume and enhancing crispness. Protan Pepin naturally integrates the polyphenolic structure of wines and reverses the oxidation process. Aldehydes and port-like odors are adsorbed to be used as ethanal bridges for the polymerization of the complex molecule, a process that ultimately leads to softer tannins and color stability.

**Dosage: whites:** 30 to 120 ppm. Reds: 100-500 ppm.

**Packaging:** 500 gram packets



**Protan Peel:** proanthocyanidins tannin obtained from unfermented and pressed grape skins. It produces high astringency the moment at which the addition is performed, but it also undergoes a quick softening during the first 3-4 weeks of maturation. Protan Peel addition results in a longer shelf life and consequent color stability of the wine. It mimics extended maceration effects to create richer, more supple wines with greater aging ability and less bitter tannin.

**Dosage:** for whites 30 ppm are a good start for light varieties like Sauvignon Blanc, Chenin, or even French Colombard. In Reds start with 100-500 ppm. The higher dosages are recommended in fermentation.

**Packaging:** 1 kg bottle and 10 kg pales

**Protan Raisin:** granulated grape skin tannin from Burgundy. It performs best when used to integrate the oak and the fruit of the wine, building a velvety, smooth structure and reversing the oxidation process. In white wines, a small addition goes a long way in protecting from oxygen, building volume, and enhancing crispness. Protan Raisin boosts the body and mid-palate of the wine, simulating extended maceration without the downside of bitter compounds. Proanthocyanidinic tannins are also the final receptor for color pigments and polymerizing tannins, ensuring the correct development of wine during the aging process.

**Dosage:** whites: 30 to 120 ppm; reds: 100-500 ppm. When adding Protan Raisin in a bench trial, wait for at least 3 days to evaluate.

**Packaging:** 500 gram packets

**Tanéthyl:** tannin extracted from grape seeds with an active ethanal bridge. Tanéthyl is a great tool for achieving the big, soft structure provided by MOX, through color stabilization and tannin polymerization. It can be used both in reds and whites to increase volume and to balance a rough polyphenolic profile. In wines with high pH where micro-oxygenation is not recommended, Tanéthyl can continue the polymerization process of polyphenols even in a reductive environment.



**Dosage:** rosé wines: 50 to 150 ppm; red wines: 120 to 360 ppm.

**Packaging:** 1 kg packets

**Utilization:** rehydrate in warm water (95°F/35°C) or wine, for 1\2 h before mixing. Then make a 1:10 slurry and add directly to circulating tank or barrel all at once or by fractional additions throughout the winemaking process as needed. Wait at least a week before filtering.

**Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place

## **FINISHING TANNINS**

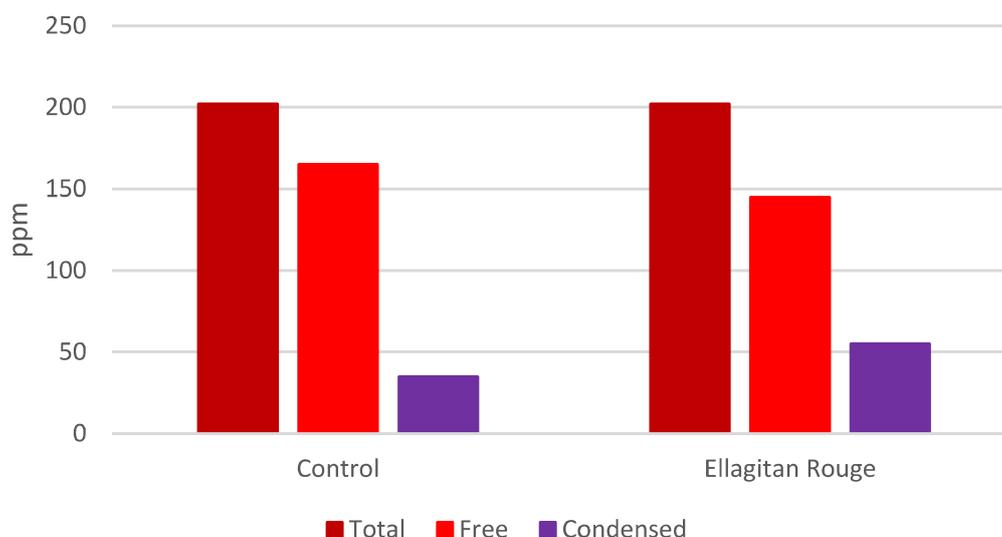
**Ellagitan Barrique Rouge:** granulated tannin from highly toasted oak wood. It prolongs the aromatic persistency, improves the mellowness of wines, and integrates their aromatic complexity with delicate nuances reminiscent of chocolate and vanilla.

**Dosage:** Minimum dosage for light nuances in reds is 100 ppm . Higher dosage will increase its impact. In whites, it may be dosed at 30-120 ppm.

**Packaging:** 500 gram and 10 kg bags.



## Anthocyanins



Ellagitan Rouge promotes anthocyanins stability through polymeric pigment formation.

**Ellagitan Barrique Blanc:** extracted from French oak staves, it has minimal effects on the color and contains gum Arabic. Ellagitan Barrique Blanc is used to highlight the varietal aromas of white and rosé wines. It is recommended for those wines that have had a prolonged cold skin-contact maceration, which are often rich in polyphenols and tend to brown, but also craft ciders. Wines will result fresher and livelier to the palate, free of unpleasant bitterness, and rich in body, similar to the results of oak barrel-aging.

**Dosage in white wines:** 60- 500 ppm.

**Packaging:** 500 gram packets.

**Utilization:** rehydrate in warm water (95°F/35°C) or wine, for 1\2 hour before mixing. Then, make a 1:10 slurry and add directly to circulating tank or barrel all at once or by fractional additions throughout the winemaking process as needed.

Wait at least a week before filtering.

**Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place.

## HOW TO PREPARE A SOLUTION FOR A BENCH TRIAL

A bench trial is a small-scale trial meant to simulate the addition of an additive or fining agent to a larger volume of wine. To make a bench trial with one of these products, liquid or powder, you will need:

- Scale precise to the tenth of gram
- 100 ml flask
- 1-10 ml graduated pipettes or dropper
- Containers for the product solutions (1 for each product trialed)



**1.** Prepare stock solution: weight 1.2 grams of product, either liquid or powdered (what counts is still the weight, so pipette liquid products on the weight dish right on the precision scale). Add some wine to rinse off the weight dish into the flask and bring solution to 100 ml with the same wine to be treated.

**2.** If using a fining product, use water instead of wine.

**3.** Add stock solution to desired wine in order to achieve the dosage rate that you are looking for. Every 1 ml of stock solution added to 100 ml of wine will be equal to an addition of 12 g/hL (120 ppm or 1 lb/1000 gal).

### BENCH TRIALS CHEAT SHEET

	Bench Trial Stock Solution 12% w/v	100 ml Bench Trial 120 ppm = 1 lb/1000 gal	120 ppm into 3800 L = 1000 gal
Arabinol	1.10mL/100 mL	1 ml stock into 100 mL	418 ml
Arabinol Arome	1.15mL/100 mL	1 ml stock into 100 mL	437 ml
Arabinol HC	1.03mL/100 mL	1 ml stock into 100 mL	392 ml
Gelsol	1.00mL/100 mL	1 ml stock into 100 mL	380 ml
Spindasol	1.00mL/100 mL	1 ml stock into 100 mL	380 ml
Carbosil	1.00mL/100 mL	1 ml stock into 100 mL	380 ml
Liquid Tannin	1.00mL/100 mL	1 ml stock into 100 mL	380 ml

Densities of liquid products and cheat sheet for additions.

**Ellagitan Barrique Liquid:** the most “French” of the five and the one with the strongest vanilla taste. It opens the fruit of the wine, enhancing the red and black berries. Also, it brings a peppercorn note to the spices in the bouquet. Great to hide defects in certain wines.

**Eb Berry Mix:** helps stabilizing the color but also introduces a soft note that brings structure and smoothness. In the nose, it enhances the sweet notes of the fruit and adds a pleasant bouquet of spices and toasted oak.

**Eb Fruit Reserve:** has the least impact on the aromatics of the wine among the five liquid ellagitan barrique products, meaning that it marks less and should not be used to cover defects. It helps the wine to “take-off” with what the wine already has, enhancing the fruit and opening the bouquet. It also brings notes of almonds and caramel.

**Eb Goud-ron:** helps stabilizing the color, but also introduces a soft note that adds structure and smoothness. In the nose, it shows notes of “goudron” (tar), a typical descriptor of old-world wines, reminiscent of the ones found in the great reds from rhône and piedmont.

**EB XO:** gives a smoky/toasted note that works great for wines where we want to enhance the spices, chocolate, leather, and earthy sensations. Not recommended in smoke tainted or Brett-affected wines. It helps hide most other defects, like burnt rubber or methoxypyrazines.

**Utilization:** dilute in 10 parts of wine and add to fermentation or at any other stage. It is better to avoid additions 2 weeks before micro-filtration. Sediments in the bottle are normal occurrences which could be dissolved in wine or hot water.

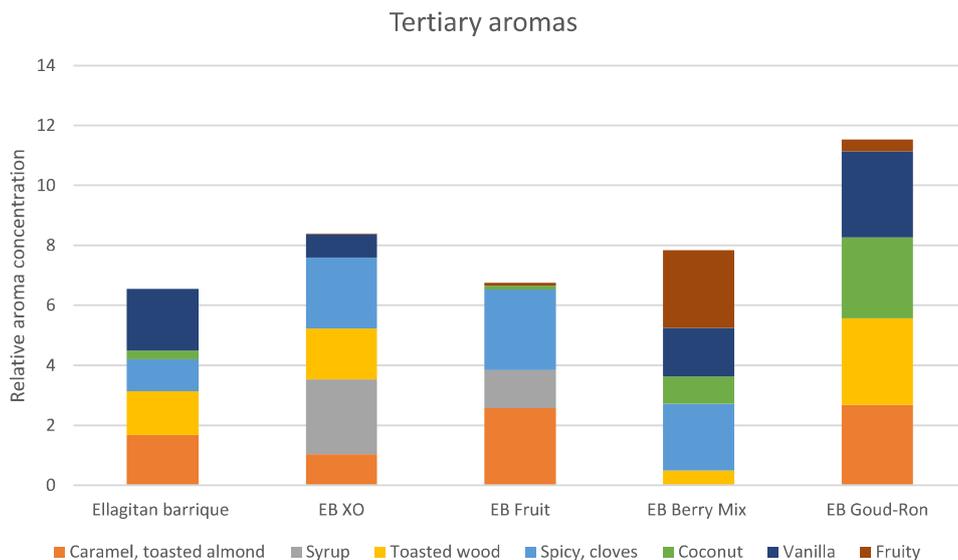
**Dosage:** Average dosages range 120-720 ppm or 10-60 ml/hL. Minimum dosage for light nuances in reds is 120 ppm. Higher dosage will increase the impact. In whites, it may be dosed at 30-120 ppm.

**Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place.

**Packaging:** 1 kg bottles, 10 kg pales.

## **WHAT ARE THE ADDITIVES USED IN WINEMAKING OR AGING THAT CAN HAVE AN IMPACT ON THE FRUIT AROMA?**

1. Appropriate enzymes can help to better manage extraction and promote the diffusion of aromatic precursors present in the skins, while reducing the maceration time,
2. The use of oenological tannins can shorten the process of vinification, thus preserving more fruity aromas.
3. The addition of polysaccharides reinforces the fruity character while bringing roundness and sweetness.
4. The use of lactic acid bacteria in co-inoculation or after alcoholic fermentation can guarantee a rapid start of malolactic fermentation and limit organoleptic deviations (Brettanomyces, biogenic amines),
5. Complex yeast nutrients, used in doses of 150 to 300 ppm, limit the risk of reductive taste and promote esters' production.



Ellagitan barrique line is derived from quality American and/or French oak; these tannins can impart welcome notes of coconut and vanilla, perception of sweetness, and a very aromatic profile, depending both on the source of wood and on the toasting levels of a finished wine. Ellagitan barrique line can also be used to extend the life of used barrels. It offers numerous advantages over other oak alternatives: it is immediately soluble, does not release undesirable substances, such as resins or bitter compounds, and inhibits bacteria or mold contamination, thus reducing the need for SO<sub>2</sub>. Furthermore, there is no color or wine loss due to wood absorption.

$\mu\text{g/g}$	Sensory Descriptors	Ellagitan barrique	EB XO	EB Fruit Reserve	EB Berry Mix	EB Goud-Ron
Furfurale	Caramel, Toasted Almond	101	1	109	40	190
5-Metil furfurale		25	45	33	0	12
2(5H)-furanone		15	22	22	50	12
5-Idrossi metil furfurale		141	168	184	70	142
Coniferaldeide	Syrup	0	1625	822	0	0
Guaiacolo	Toasted Wood	115	53	49	70	142
Siringaldeide		4706	5075	2598	3300	6760
Fenolo	Spicy, Cloves	11	5	7	43	13
Eugenolo		2	3	3	1	2
Isoeugenolo		2	5	6	nd	nd
4-Vinil guaiacolo		14	33	34	nd	nd
cis-Wisky lattone	Coconut	2	0	0	5	13
trans-Wisky lattone		93	43	66	210	540
Vanillina	Vanilla	1541	1084	806	1700	2220
Acido vanillico		69	19	1	nd	nd
Acetovanillone		185	127	110	nd	nd
Acido omovanillico		217	265	266	130	120
2.Feniletanolo	Fruity	nd	nd	5	400	61
.Etillsuccinato		nd	3	15	82.6	12.1

