



IMPROVEMENT THROUGH BIOTECHNOLOGY
-SINCE 1963-

Winemaking Handbook

VOLUME 12

As millennials are taking over this planet and a global pandemic is mining the economy world wide, the wine market is challenged by industries and events so far out of the radar just a few years ago. Spirits and cannabis are gaining shares, and winemakers are more and more in need of tools to be ahead of the curve. From water saving to virus proof cleaners, from organic to allergenic-free, from vegan-friendly to various quality certifications, we cover the most recent requirements in the modern processing of grapes into wines.

We will be with you when you start a fermentation to convert grapes into a beautiful wine, but also when you ferment sugar and water to make a flavored seltzer. As a lead supplier of biotech and industry equipment, AEB technologies are created using applied science and research which allows us to craft unique formulations as we employ our honed skills in the field of wine-making. From fermentation to fining, filtration to cleaning, our clients and consumers are given the advantage to use their skills backed by our innovative tools for processing and treatment of their wines.

AEB prides itself in not only offering intel and providing a wide range of products, but also in partnering with the winemakers from around the world and have done so for more than half a century. AEB wants to be a part of your world and assist you by keeping our industry where it belongs: at the top.



Marco Bertaccini, GM AEB Regional Manager



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CHAPTER ONE

Yeast

Fermol, the right yeast to create quality wine

The yeast collection from AEB labs is the result of rigorous selections made in collaboration with prestigious research institutes like University of Modena and Reggio Emilia, the University of Firenze and the Université de Montpellier.


The extensive range available is characterized by:

- Its ability to generate aromatic precursors, to produce fermentation esters and acetates in variable quantities and proportions.
- To synthesize glycerin, acids and mannoproteins.
- Extremely limited production of compounds which could negatively interfere with wine's quality.

TYPE	COMMERCIAL NAME	SPECIES	CHARACTERISTICS	SUGGESTED UTILIZATION	AVERAGE YAN CONSUMPTION	ETHANOL TOLERANCE
BIG REDS	FERMOL PREMIER CRU	CERVISIAE	FERMENTS ELEGANT BIG REDS KEEPING INTACT THE MAIN CHARACTERISTICS OF THE VARIETAL FERMENTED	CABERNET SAUVIGNON, CABERNET FRANC, PETIT VERDOT, SANGIOVESE, NEBBIOLO, NORTON	270 PPM	16%
	FERMOL MEDITERRANÉE	CERVISIAE	FERMENTS RICH REDS ADDING A FRUITY AND JAMMY LAYER	MERLOT, PINOT NOIR, RHÔNE VARIETIES, SHIRAZ, MALBEC, TEMPRANILLO, BACO NOIR	200 PPM	16%
	FERMOL SUPER 16	CERVISIAE	FERMENTS HIGH ALCOHOL REDS AND ENHANCES EXTRACTION	CABERNET SAUVIGNON, ZINFANDEL, PRIMITIVO, PASSITO STYLE REDS AND WHITES. ICE WINE	265 PPM	17%
FRUITY REDS	FERMOL RED FRUIT	CERVISIAE	FERMENTS FRESH AND FRUITY REDS WITH LOW YAN NEEDS	FRUITY RED VARIETIES LIKE GAMAY, GRENACHE, CINSULT, ZWEIGELT, LAGREIN, MARECHAL FOCH, FRONTENAC	220 PPM	15%
	FERMOL ROUGE	CERVISIAE	WORKHORSE FOR REDS	CALIFORNIA CENTRAL VALLEY REDS, SANGIOVESE, MONTEPULCIANO	250 PPM	16%

TYPE	COMMERCIAL NAME	SPECIES	CHARACTERISTICS	SUGGESTED UTILIZATION	AVERAGE YAN CONSUMPTION	ETHANOL TOLERANCE
FLOWERY WHITES	FERMOL FLORAL	CERVISIAE	WORKS ON CYSTEINE TO BUILD FLOWERY BOUQUETS	PINOT GRIGIO, SAUVIGNON BLANC, GRÜNER VELTLINER, TREBBIANO/UGNI BLANC, PROSECCO PRIMARY	280 PPM	15%
	FERMOL LIME	CERVISIAE	ENHANCES GENERAL CITRUS AROMAS	PINOT GRIGIO, KERNER, PROSECCO PRIMARY, PINOT GRIS, MULLER THURGAU	280 PPM	15%
	FERMOL AROME PLUS	CERVISIAE	SHORT LAG PHASE FOR CLEAN AND AROMATIC WHITES	PINOT GRIGIO, MOSCATO, RIBOLLA GIALLA, RIESLING, GEWÜRTZ	340 PPM	14%
	FERMOL SAUVIGNON	CERVISIAE	ENHANCES 4MMP IN SAUV BLANC	SAUVIGNON BLANC, VERDICCHIO, TOCAI	250 PPM	15%
	FERMOL ELEGANCE	CERVISIAE X BAYANUS	PRODUCER OF PHENILETHYL ALCOHOL (FLOWERS) AND INCAPABLE OF ASSIMILATING SULPHUR (MINIMAL H ₂ S)	PINOT GRIGIO, ALBARIÑO, CHENIN	200 PPM	15%
	GLUTA Ferm ONE	CERVISIAE	ENHANCES THE TYPICAL NOTES OF THE VARIETY FERMENTED. IT PRODUCES HIGH AMOUNTS OF THE ANTIOXIDANT GLUTATHIONE	SAUVIGNON BLANC, CHENIN, GRUNER VELTLINER	260 PPM	15%
TROPICAL FRUITY WHITES	FERMOL TROPICAL	CERVISIAE	TARGETS CERTAIN AMINO ACIDS FOR THE PRODUCTION OF TROPICAL ESTERS	CHARDONNAY, VIOGNER, VIGNOLES, VIDAL, SEYVAL BLANC	280 PPM	15%
	FERMOL CHARDONNAY	CERVISIAE	QUICK AUTOLYSIS OF THE CELL FOR OPTIMIZED SUR LIE AND VISCOSITY	CHARDONNAY, VIOGNER, RIBOLLA GIALLA	245 PPM	15%

TYPE	COMMERCIAL NAME	SPECIES	CHARACTERISTICS	SUGGESTED UTILIZATION	AVERAGE YAN CONSUMPTION	ETHANOL TOLERANCE
STONE-FRUIT FRUITY WINES	FERMOL BLANC	BAYANUS	FRUIT WINE AND FRUITY WHITE WINES IN GENERAL .	PROSECCO BASE AND SECONDARY FERMENTATION	250 PPM	16%
	FERMOL 2	BAYANUS	WHITE WINES WORKHORSE. WORKS IN MOST CONDITIONS OF STRESS.	GENERIC FRUITY WITNES, FRUIT-BASED WINES, MEADS, CIDER	250 PPM	16%
ROSÉ	FERMOL PB 2033	CERVISIAE	SELECTED IN THE CÔTES DE PROVENCE FOR PROVENCE STYLE ROSÉ WINES PRODUCTION.	FLORAL AND FRUITY AT THE SAME TIME. FERMENTS IN A BROAD RANGE OF TEMPERATURES GIVING GOOD RESULTS ALSO IN SHORT FERMENTATIONS	200 PPM	15%
SPARKLING	LEVULIA CRISTAL	BAYANUS	KILLER POSITIVE YEAST, CERTIFIED FOR CHAMPAGNE PRODUCTION IN FRANCE. UTILIZED FOR THE PREMIÈRE FERMENTATION AND LA PRISE DE MOUSSE	RECOMMENDED FOR METHOD CHAMPENOISE PRIMARY AND SECONDARY FERMENTATION	250 PPM	16%
	FERMOL CHARMAT	BAYANUS	LOW NUTRITION REQUIREMENT AND HIGHLY CRYOPHILIC. IDEAL FOR PRISE DE MOUSSE (SECONDARY FERMENTATION)	LPROSECCO BASE AND SECONDARY FERMENTATION. FRUIT-BASED WINES, MEADS, CIDER	220 PPM	15%
SACCHAROMYCES UVARUM FOR EXTREMELY LOW-TEMP FERMENTATION	 FERMOL CRYOFRUIT	SACCHAROMYCES UVARUM	"BOTTOM FERMENTING" YEAST (DOES NOT FORM FOAM), HIGH GLYCERIN PRODUCER, RESISTANT TO EXTREMELY LOW TEMPERATURES	IT HAS BEEN SUCCESSFUL FOR STRUCTURED WHITES, ROSÉ AND FRUITY RED WINES.	MEDIUM	15%
NON-SACCH FOR LACTIC ACID BOOST AND LOW ALCOHOL CONVERSION	LEVULIA ALCOMENO	LACHANCEA THERMOTOLERANS (EX-KLUYVEROMYCES THERMOTOLERANS)	CARRIES OUT THE LACTIC FERMENTATION FROM SUGARS AND ALLOWS BRINGING WINE FRESHNESS AND BALANCE TO THE MOUTH.	FOR WINES IN NEED OF MORE EQUILIBRIUM BETWEEN ACIDITY AND ALCOHOL.	AVERAGE	7%

TYPE	COMMERCIAL NAME	SPECIES	CHARACTERISTICS	SUGGESTED UTILIZATION	AVERAGE YAN CONSUMPTION	ETHANOL TOLERANCE
NON-SACCH FOR ENHANCED MOUTHFEEL AND AROMA	 LEVULIA TORULA	BRINGS NON-SACCHAROMYCES THIOLS, TORULASPORA DELBRUECKII KEEPS VA DOWN. BIG RELEASE OF POLYSACCHARIDES FROM THE LEES.	TO INCREASE COMPLEXITY IN AROMATIC VARIETIES.	FOR WINES IN NEED OF MORE EQUILIBRIUM BETWEEN ACIDITY AND ALCOHOL.	AVERAGE	9.5%
NON-SACCH FOR BIODYNAMIC PROTECTION	PRIMAFLORA VR	METSCHNIKOWIA PULCHERRIMA	STRONG ANTI-BRETTANOMYCES ACTIVITY. ALSO, A STRONG ENZYMATIC ACTIVITY CONTRIBUTES TO THE RELEASE OF AROMAS AND NITROGEN ENRICHMENT OF THE MUST	FOR RED GRAPES TO REPLACE SO2 APPLY IN THE VINEYARD, OR AT THE EARLIEST MOMENT THAT IS CONVENIENT IN BETWEEN PICKING THE GRAPES AND CRUSHING THEM.	N/A	3%
NON-SACCH FOR BIODYNAMIC PROTECTION	PRIMAFLORA VB	TORULOSPORA DELBRUECKII	DIMINISHES VOLATILE ACIDITY. IS ACTIVE AGAINST BRETTANOMYCES, B. BRUXELLENSIS; P. GUILLIERMONDII; P. MANSURICA; P. MEMBRANIFACIENS. ITS ENZYMATIC ACTIVITY ALSO CONTRIBUTES TO THE RELEASE OF AROMAS AND SIMPLE SUGARS RELEASE.	FOR WHITE GRAPES TO REPLACE SO2. APPLY IN THE VINEYARD, OR AT THE EARLIEST MOMENT THAT IS CONVENIENT IN BETWEEN PICKING THE GRAPES AND CRUSHING THEM.	N/A	3%



Yeast for white wines



Fermol Arome Plus: Fermol Arôme Plus produces wines with very intense aromas in which the varietal notes of the fruit, blend harmoniously with the fermentative aromas produced by the yeast. Fermol Arôme Plus accentuates floral notes and creates wines with an elegant taste supported by a good acidity.

It has a negative POF character, therefore it does not produce volatile phenols which can give to wine unpleasant olfactory notes, reminiscent of varnish. This strain is also characterized by an excellent resistance to alcohol content and sulfur dioxide and is able to start fermentation at very low temperatures (12 C).

Highlights:

- Recommended in co-fermentation with Fermol Chardonnay for modern round and aromatic whites.
- When using this strain, be aware of the high YAN demand.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs



All yeast from the Fermol line are Certified Kosher

Fermol Elegance: It is a strain obtained from natural hybridization, which is distinguished by its excellent fermentation kinetics and the wide aromatic range that is able to enhance. It has a beneficial effect on the release of terpenes glycosides and accentuates the synthesis of β -phenylethyl acetate.

These compounds, also adding to the liberation of thiols, lead to accentuate citrus, floral and aromatic herb notes. The wines fermented with Fermol Elegance are distinguished by the uniqueness of the aromatic notes, intended to enhance the terroir expression of the vineyard.

Highlights:

- It is unable to process sulfur compounds coming from the vineyards or from excessive additions of potassium metabisulfite. This results in a bouquet that is elegant and clean from reductive odors.

Available only in 500 grams packs

Glutaferm One: It is ideal for exalting the varietal notes because it does not interfere with the aromatic profile of the grapes. Glutaferm One can be successfully used in the production of prestigious white wines, whose aromatic intensity needs to be protected during aging; thanks to the release of glutathione in the medium it is particularly interesting for wines obtained from hyper-reduction. The aromatic range obtained by fermenting must with Glutaferm One is complex and rich in floral and tropical fruit nuances, with evident hints of passion fruit and grapefruit. If the must is processed in hyper reduction, the most noticeable notes are sage and boxwood.

Highlights:

The quantity of glutathione present in the wine at the end of the fermentation often reaches values above 5 mg/L. GSH adds an antioxidant component, preserving the fresh aromas and the color of delicate wines.

Available in 500 grams packs

Fermol Blanc: A bayanus yeast with very low nitrogen requirement.

This strain develops very well, even at low temperatures. It does not produce H₂S, except in case of extreme lack of nutrients; therefore, this strain is particularly recommended for maturation on the lees. The resulting wines are full bodied with very complex aromas which, depending on the cultivar, are reminiscent of flowers, citrus or white-pulped fruit.

Highlights:

- Its resistance to adverse conditions, like low nutrition, cold temperatures or high alcohol, makes this strain also ideal for Cider, fruit wines and mead.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs

Fermol Chardonnay: It highlights the nuances of ripe and exotic fruit and, thanks to its high production of mannoproteins, produces wines with a full and harmonious taste.

Being especially cryophilic, it is particularly suitable to produce prized white wines, whether obtained by cold macerated or refined in barriques. The aromatic intensity, already high during fermentation, increases substantially during the refining and maturation stage.

Highlights:

- Because of its nature, this strain originates 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.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs

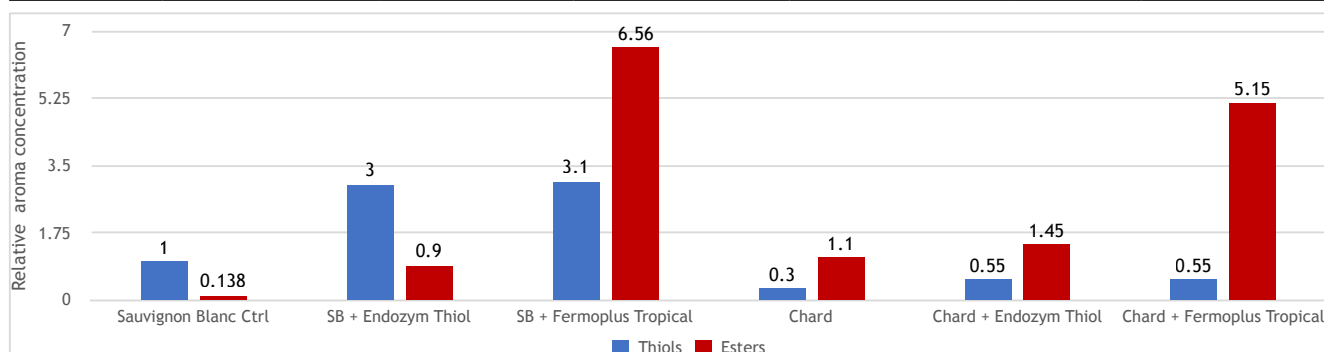
Fermol Sauvignon: It highlights the notes of aromatic sulfur compounds (thiols) enhancing box tree and passion fruit with scents reminiscent of aromatic herbs, white flowers and nettle. Indicated to use in Sauvignon, but also to enhance complexity in more neutral white grape varieties. It is cold resistant and can ferment well at 10°C–50°F.

Highlights:

- When fermenting with Fermol Sauvignon, add Fermoplus Tropical (250 ppm or 3 lbs./1000 gal), to maximize tropical notes and complexity, or Endozym Thiol 5 ml/hL to increase varietal expression.
- Killer factor positive.

Available in 10 kg bags and 500 grams packs

	CHARD + FERMOPLUS TROPICAL	SAUVIGNON BLANC CTRL	SB + ENDOZYM THIOL	SB + FERMOPLUS TROPICAL	CHARD	CHARD + ENDOZYM THIOL
THIOLS	1	3	3.1	0.3	0.55	0.55
ESTERS	0.138	0.9	6.56	1.1	1.45	5.15



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.

The “thiols producers” yeast collection:



Scan the QR code for more info



Fermol Fleur: it enhances floral ester production. Suggested for all types of winemaking for which we wish floral aromatic notes well marked both in the nose and mouth, and well-defined bouquets.

Widely used in whites but also for the development of modern rosé wines, where winemakers look for a very pronounced and intense bouquet. Because of its low consumption of malic acid, it's also Indicated for fermentations of musts from hot regions, to maintain freshness. The bouquet that develops with Fermol Fleur is reminiscent of white flowers, with balsamic and menthol notes that are very noticeable also in the aftertaste.

Available in 500 grams packs



Fermol Lime: it naturally enhances the citrusy profile of varieties that are known for their bouquet rich in lime, lemon and grapefruit notes. When fed with the most modern, amino acids based, yeast nutrients like Fermoplus Floral, the characteristics of citrus and herbal aromas are boosted.

Because of its low consumption of malic acid, it's also indicated for fermentations of musts from hot regions, to maintain freshness. It is highly recommended for co-fermentation with Fermol Fleur to produce modern and fragrant Pinot Grigio, Sauvignon Blanc, Grüner Veltliner and other cold-climate varieties.

Available in 500 grams packs



Fermol Tropical: Yeast for varietal and aromatic white wines (Viognier, Fiona, Vermentino, Sauvignon, Chardonnay). It can also be used to produce modern rosé wines, with a very intense aroma. The bouquet developing from the fermentation is reminiscent of summer and tropical fruit with hints of sage. The utilization of this strain is ideal to increase the aromatic notes of wines.

The ideal fermentation temperature in order to fully express its characteristics is between 55 and 60°F; the production of esters and acetates increases with a proper amino acid (organic) nutrition.

Available in 500 grams packs

Highlights:

- This collection of yeast is the result of research conducted by AEB in collaboration with the IFV (Institut Français de la Vigne et du Vin), a product for the most modern wines, that are required to always show the fragrance typical of the variety. We used a breeding-based genetic improvement strategy, to obtain yeast strains characterized by an improved thiol release.

Thiols are a class of organosulfur compounds much appreciated by the consumers: 4MMP ("boxwood" and "blackcurrant"), 3MH ("passion fruit", "grapefruit" and "citrus") and 3MHA ("tropical", "passion fruit" and "rose"). The strategy was used to insert the specific traits of interest, (increased production of volatile thiols) between the Fermol Chardonnay, producer of a complex aromatic imprint, and the PB2033, strain with strong fermentative performance. The crossover procedures created many hybrid strains. Initially, the best 28 were tested for the main oenological parameters like alcohol, volatile acidity, hydrogen sulfide, residual sugars, fermentation kinetics. Then further assessed for performance in conditions of nutritional deficiency and aroma compounds production (acetate-esters, ethyl esters, terpenes, alcohols and acid alcohols). Fermol Floral, Fermol Lime and Fermol Tropical were chosen for their enhanced oenological features to boost varietal thiols aroma, but also to increase the sensory perception of more neutral varieties.



Yeast for reds and rosé wines:

Fermol Méditerranée: It is a strain suitable to obtain warm and full-bodied red wines, well suited to aging, but already very pleasant at the end of fermentation. The peculiarities of Fermol Méditerranée are due to its ability to produce a high content of glycerol (6.5 g/L), polysaccharides and mannoproteins which, besides giving a greater harmony of taste, also allows a rapid stabilization of color and tannic structure. From the aromatic point of view, it highlights the varietal complexity and amplifies the sweet notes, reminiscent of ripe fig jam and small red fruits, especially currants and cherries.

Highlights:

- Ideal for organic winemaking because of the low YAN requirements.
- It has extremely low nutrition needs and consequently low H₂S production.
- It carries a killer phenotype that helps the strain to quickly dominate the fermentation minimizing VA.

Available in 10 kg bags and 500 grams packs

Fermol PB 2033: It is a strain selected in France in the Côtes de Provence area. It's particularly suitable to produce rosé and young wines and able to ferment in a wide temperature range (12-34°C) with a very fast start and regular kinetics that allows easy control of fermentation temperatures. The typical bouquet is reminiscent of red currant, sour black cherry, raspberry, strawberry and white flowers. A typical yeast for producing French style rosé.

Highlights:

- Thanks to the limited hydrophilic characteristics of the cellular wall, this strain limits adsorption and fixation of the anthocyanins, promoting an optimized rosé color.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs

Fermol Premier Cru: is a yeast selected to produce structured and complex wines, suitable for aging. It develops intense and clean aromatic notes, as it has an extremely limited production of H₂S. It enhances the complexity and typicity of the grape varieties, harmoniously combining a wide range of aromatic nuances reminiscent of berries, spices, aromatic herbs and small red fruits. It expresses a good full-bodied taste due to its ability to produce significant amounts of glycerin and polysaccharides.

Highlights:

- It has minimal or none SO₂ production, facilitating ML.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs



Fermol Rouge: Thanks to its vigor and resistance, it rapidly prevails over the indigenous flora, found in large quantities in red wine vinification. Fermol Rouge is particularly recommended to produce young wines and wines for medium-term aging, with intense red berries aromas and good structure. Furthermore, when compared to other selected yeasts, Fermol Rouge produces wines with more intense color, given its limited ability to fix the coloring substances extracted during maceration.

Highlights:

Short lag-phase, followed by a fast and regular fermentation curve, makes Fermol Rouge ideal for optimizing tanks turnover.

Available in 10 kg bags and 500 grams packs

Fermol Red Fruit: It is characterized by a high fermentative vigor that is maintained even in stressful conditions such as in musts with high sugar content. Fermol Red Fruit is particularly suitable for the fermentation of young and bright red wines, where it enhances the aromatic characteristics of the variety, emphasizing the formation of esters that give to the wine floral and fruity aromas such as blueberry, currant, raspberry. This yeast is also ideal for the vinification of structured red wines with a smooth and large mouthfeel.

Highlights:

- A correct nutrition is indispensable to maximize its aromatic characteristics.
- Killer factor neutral.

Available in 10 kg bags and 500 grams packs

Fermol Super 16: is a very versatile yeast, which in California has found its match with Zinfandel and high-end Cabernet Sauvignon. Fermol Super 16 has been isolated from extremely mature grapes for "passito" style. This strain is adapted to high sugar content and extreme osmotic conditions. It's ideal for batches made with high percentages of raisins and overripe grapes. Complements a clean fermentation with a bouquet of fresh and straight fruit. It yields wines with a crisp and clean edge that show a long and complex finish in the mouth. It can perform at very high temperatures and high alcohol. The cells flocculate very well, and the wine is easy to filter just a few days after the end of the fermentation.

Highlights:

- Side by side trials have showed how Fermol Super 16 has higher production of extractive enzymes promoting maceration.

Available in 10 kg bags and 500 grams packs

Yeast for sparkling wines

Levulia Probios: is a 100% organic yeast, derived from a selection conducted in Champagne. Its excellent fermentation capacity, even under difficult conditions of pH, temperature and alcohol, make it an essential yeast for base wines production and for the “prise de mousse” method. It allows secure fermentation, with total sugar consumption and a very low production of undesired by-products, such as volatile acidity, pyruvic acid and SO₂. Levulia Probios is also suitable to produce still white wines. Its fermentative attitude guarantees the production of dry, aromatic wines, respecting the territory and the varietal typicity.

Highlights:

- Certified Organic

Available in 500 grams packs

Fermol Charmat: has an exceptionally high fermentation rate and does not cover the varietal aroma. The low nutritional requirements, the high alcohol content and the strong cryophilic phenotype make Fermol Charmat particularly suitable for pressured tanks or champenoise method. Excellent results have also been obtained in the treatment of stuck fermentation. Fermol Charmat particularly accentuates the white fruits and citrus notes in white wines. Killer factor neutral.

Available in 500 grams packs

Non-conventional yeast

Fermol Complete Killer Fru: Selected for its 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, when other strains often leave it behind. Thanks to its killer phenotype, it quickly gains dominance reducing the existing population of wild yeast, and because of its high alcohol tolerance, it can

be inoculated in partially fermented musts. It's highly cryophilic so is ok to use in wines that are not at ideal temperatures due to sluggish conditions.

Available in 10 kg bags and 500 grams packs

Highlights:

- Fructophilic
- Ideal for restarting stuck fermentations. See FAQ to learn how to use Fermol Complete Killer Fru to restart a stuck fermentation.
- Killer factor positive.

Cryophilic yeast (Uvarum)

NEW! **Fermol Cryofruit:** Selected and controlled by Proff. P. Giudici and A. Pulvirenti at the Microbiology department of Scienze Agrarie at the University of Modena & Reggio Emilia, Fermol Cryofruit is a yeast obtained by hybridization of *Saccharomyces cerevisiae* x *Saccharomyces uvarum*, that summarizes the specific characteristics of the two. It has been selected for its particular metabolism which shows great fermentation performance at low temperatures, alongside with high production of glycerin, which brings softness to the wine. This strain allows winemakers to get the best results when used at low temperatures, both at inoculation and fermentation.

Fermol Cryofruit in white wines, enhances the aromas of white fruit and floral, making it ideal for the vinification of all varieties. The red wines fermented with Fermol Cryofruit, have an aromatic enhancement of small red fruits, berries and violet notes. It is resistant to sulfur dioxide, has a short lag-phase and good alcoholic tolerance.

Highlights: The peculiarities of the uvarum physiological breed allow to obtain wines with a marked acid profile, balanced in the mouth by the high glycerin content.

Available in 500 grams packs

Non-Saccharomyces Yeasts

There is increasing awareness on the contribution of non-Saccharomyces yeast species to wine sensory features, either as wild microbiota, or as complementary starters in simultaneous or sequential inoculation. In most cases, both the metabolic pathways are leading to aroma-active compounds from these alternative yeast species. Previous studies have shown that fermenting juice with indigenous yeast can potentially increase the complexity of the wine due to the contribution of various yeast species. However, the lack of reproducibility and predictability of these types of ferments has led winemakers to opt for predictable commercial yeast preparations. The complexity provided by indigenous ferments can, however, be simulated to some extent by inoculating the must with “wild” yeast strains, thereby ensuring a large enough yeast population and desirable conditions. The co-inoculation of non-Saccharomyces yeasts and *Saccharomyces cerevisiae* in grape juice is becoming an increasingly popular practice to diversify wine styles and/or to obtain more complex wines with a peculiar microbial footprint.

However, not all the yeasts present on the grapes impart desired characteristics: some yeasts could be the origin during fermentation and/or aging of unwanted aromas. Then there is the need to study and select NS yeasts with only positive oenological characteristics. Over the last few years, AEB in collaboration with University of Dijon, isolated and genetically identified up to 1000 different yeast strains, belonging to 16 different genera. 100 ml and 20 L microvinification experiments were used to characterize the positive impact on the chemical and aroma composition of the wine. Among yeast species relevant metabolic features have been identified in *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, from the stage of alcoholic pre-fermentation, to the organoleptic complexity of wine.

Levulia Alcomeno carries out the lactic fermentation from sugars and allows bringing wine freshness and balance to the mouth. The result is a high increase of total acidity and a decrease of the alcohol content. At the analytical level, wines fermented with Levulia Alcomeno are differentiated by a decrease of the alcohol content and an increase of lactic acid. Such physical-chemical variations depend on the grape, the climatic conditions and the quality of the yeast settling in the must.

Levulia Alcomeno can ensure the alcoholic fermentation at least up to 7% of the volume. It is used in sequential inoculation, depending on the desired acidity.

Highlights:

- Certified Organic
- Must be inoculated at the beginning of fermentation instead of *S. cerevisiae*.

After 3 days of active fermentation (5-7 °Brix drop) re-inoculate with the desired *S. cerevisiae*.

- Killer factor neutral.

Available in 500 grams packs



Levulia Torula (Certified Organic): is 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 contributes to reduce the sensations of astringency in the mouth by the release of polysaccharides. 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 at least up to 9% of the volume and can be used alone, in co-inoculation or sequential inoculation (24 to 48h) with the desired *S. cerevisiae*.

Highlights:

- Certified Organic
- Levulia Torula has very low acetic acid production in high sugar must, making it ideal for sweet/late harvest wines.
- Killer factor neutral.



Primaflora (Certified Organic): Primaflora is a Bio-protection (low SO₂ winemaking) non-Saccharomyces yeast, belonging to *Metschnikowia pulcherrima* specie. Among the characteristics of this strain there are a strong anti-Brettanomyces and antibacterial activities, since it produces pulcherrimic acid which depletes the media from iron, creating unfavorable conditions for Brett (Oro et al., 2014). Through its enzymatic activity, *Metschnikowia pulcherrima*, also contributes up to a certain extent to the release of aromas and Nitrogen enrichment of the must.

Its main enzymatic activities are:

- Activity Cys-β-Lyase: release of thiols (Zott, 2009)
- Activity β-glucosidase: release of terpenes (Günata et al, 1990)
- Aspartate protease activity: release of peptides or amino acids (Theron et al., 2017).

Dosage: Primaflora VB: For white or rosé musts: from 30 to 50 ppm during or before pressing, or on grape harvesters. Primaflora VR: For red musts: 40 ppm on grape harvesters or during maceration and up to 80 ppm with grapes that are damaged or warm, or with a pH value of 4 or more.

Utilization: rehydrate 500 g of Primaflora in 10 liters of mineral or non-chlorinated water (4.2 lb. of Primaflora per gallon of water) at 25-30°C or 77-86°F, sugared with 50 g/L (5%) for 15 minutes.

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.

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 on sulfited must.

Shelf life and storage: store in the original sealed pack, in a dry, cool and odorless place. After opening the pack, use quickly. Store in the fridge and in the original sealed container. Mortality < 20% per year.

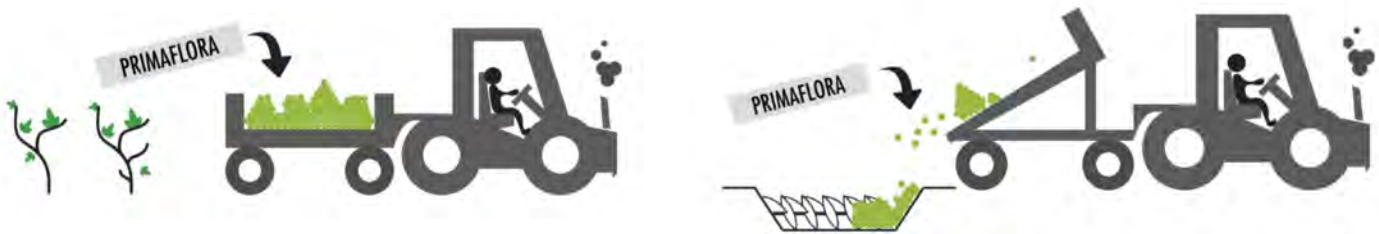
Highlights:

- Certified Organic
- It increases the aroma bouquet complexity and the “terroir” expression of the wine, promoting only the growth of desired indigenous yeast present on the grapes.

Packaging: 1 kg packets.



Scan the code to learn more about “bio protection”



Yeast rehydration & acclimation

1. Using clean and sanitized equipment, prepare 10 liters of warm water per kilogram of yeast (1.2 gallons of water per pound). *Ideal temperatures are 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.*
3. 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.

4. After 20 - 30 minutes the yeast is fully rehydrated and will now need a sugar source to stay viable.
5. 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 5 minutes. While adding the must, monitor the temperature and make sure it does not drop more than 5°C at any time during this must addition.
6. 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.
7. Repeat this step every 15 minutes until the yeast mixture is within 5°C of the tank temperature.
8. Add the inoculum to the must in the tank and ensure that the tank is properly vented to release pressure.

Highlights:

Inoculate desired yeast 10-20 times more than wild yeast. Usually 2 lbs./1000 gal inoculation rate is considered enough to ensure a safe and clean fermentation.

Clean juices can be inoculated with lower additions.

Yeasts from the Organic line can be inoculated without rehydration at 3 lbs/1,000 gallons

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 18 g/hL (1.5 lb. /1000 gal.) of Celloferm to the receiving tank. Celloferm will help to 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 6 g/hL (½ lb./1000 gallons) of Fermoplus Energy Glu rehydration nutrient.
5. To this mixture add 25 g of Fermol Complete Killer Fru yeast for every hl of stuck must to be treated (2 lbs./1000 gallons).
6. Using a paddle, mix the yeast and nutrient thoroughly.
7. Allow the yeast to rehydrate for 20 minutes.
8. Note the temperature of the yeast mixture before going on to step 9.
9. Take out of the problematic tank 250 mL of stuck must per hL of its total volume (2.5 gallon/1000 gallons).
10. Add this to the yeast mixture, making sure that during the addition the temperature does not change more than 5°C.
11. Add 25 grams of light white grape concentrate (or similar) per hL (2 lbs./1,000 gallons) of total stuck wine to the yeast slurry.

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. Around 21°C (70°F) is best.
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 (7.5 gallons/1000 gallons) and 15 grams of light grape concentrate per hL total stuck wine to the small tank and stir well.
17. Record the RS and hold over night. Make sure the small wine tank is vented.

Again, confirm that the mixture is actively fermenting before moving on.

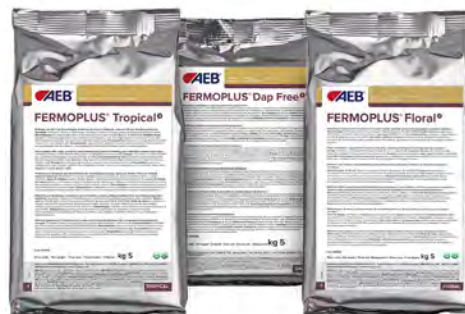
18. Add 10 more liters of stuck wine for each hL of total wine to the small tank and mix well.
19. Hold for another night.
20. Transfer the small tank to the stuck wine tank and mix well. If possible, maintain the tank temperature between 21-24°C (70 - 76°F). Monitor RS regularly.

CHAPTER TWO

**Yeast Nutrients
& Bio-regulators**

Nutrient Additions:

In grape musts the nutrients available for yeasts have a major impact on the kinetics and aromas of fermentations. Nitrogen (N) is a particularly significant nutrient, because its availability determines the fermentation rate and to a large extent, the fermentation duration. The higher the starting sugar concentration the higher the nitrogen level will need to be to complete the fermentation. In fact, the initial nitrogen level should be evaluated. If a deficiency is identified nitrogen supplements can be used to increase the level of nitrogen, with inorganic N (diammonium phosphate DAP) or organic N (amino acids).



Also, juice deficiencies of micronutrients may impact fermentation. Vitamins and minerals are important catalysts and, if not available, critical biological activities may not be able to occur. Saccharomyces only requires vitamin biotin, but the presence of other micronutrients, such as vitamins B (thiamine, inositol, pantothenic acid), potassium, sterols and unsaturated fatty acids, stimulates both growth and ethanol tolerance.

AEB provides multiple tools to specifically target nutrition requirements with the proper supplementation for:

- **Fast start and vigorous fermentation**
- **High cell vitality and viability**
- **High ethanol tolerance**
- **De-novo biosynthesis of aromas**
- **Release of varietal aromas**

CHARACTERISTICS	YEAST (AND BACTERIA) NUTRIENTS	PPM OF YAN ADDED FOR 120 PPM ADDITION (1 LB/1,000 GALLONS)
ADDS A COMPONENT FOR TOXINS ADSORPTION PLUS FACILITATES NUCLEATION AND DISPERSION OF THE YEAST CELLS	CELLOFERM	0
DAP AND Vit. B1	ENOVIT P	25
ADDS A COMPONENT FOR TOXINS ADSORPTION PLUS FACILITATES NUCLEATION AND DISPERSION OF THE YEAST CELLS. ALSO PROVIDES HIGH YAN	FERMOCEL P	11
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AN AMINO ACID ADDITION	FERMOPLUS BLANC VARIETAL	13
ADDS TO THE AMINO ACIDS CONTENT. GEARED TO A GENERIC BOOST OF AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	FERMOPLUS DAP FREE	8-10
ADDED DURING HYDRATION TO BOOST THE BIOMASS FROM 3 TO 6 FOLDS	FERMOPLUS ENERGY GLU 3.0	N/A
ADDS TO THE CISTEIN AND AMINO ACIDS CONTENTS. GEARED TO A BOOST OF FLORAL AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	FERMOPLUS FLORAL	8-10
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AN AMINO ACID ADDITION	FERMOPLUS INTEGRATEUR	18
TO GIVE A BOOST OF NUTRITION TO LACTIC BACTERIA IN CO-INOCULATION OR ADDED TO HIGH ALCOHOL WINES WHERE NUTRIENTS HAVE BEEN DEPLETED BY THE YEAST.	FERMOPLUS MALOLACTIQUE	N/A
HIGH INCREASE OF YAN PAIRED WITH THE BENEFITS OF AN AMINO ACID ADDITION	FERMOPLUS PREMIER CRU	14
RICH IN AMMINOACID FOR YEAST GROWTH IT ALSO ADDS AND ADSORBING COMPONENT THAT PHYSICALLY REMOVES PYRAZYNES	 FERMOPLUS PRY-OFF	5-8
ADDS TO THE AMINO ACIDS CONTENTS. GEARED TO A BOOST OF TROPICAL AROMATICS AND TO PROMOTE A HEALTHY FERMENTATION	FERMOPLUS TROPICAL	8-10

How much YAN?

The YAN needed for a yeast to complete the fermentation is strictly related to the strain characteristics (mentioned in the introductory yeast chart) and the must Brix. YAN stands for Yeast Available Nitrogen. It is a measure of the amount of Nitrogen available to the yeast in the grape juice. It is composed by two fractions: Ammonia (NH_4 present in must and added with DAP) and free alpha-amino Nitrogen or FAN (from the amino-acidic fraction of must or nutrients). To target YAN and add nutrients properly winemakers need to know yeast characteristics and Brix. Brix measurement refers to the concentration of sugars in the must. The traditional method for measure Brix is by using the hydrometer, which will measure the density (specific gravity) of the grape juice in Brix. 1 Brix equals 10 g/L of sugars.

TO CALCULATE TOTAL PPM OF YAN REQUIRED:

Total YAN to target for very low/ low YAN requiring strains = **Brix x 7.5**

Total YAN to target for medium YAN requiring strains = **Brix x 9**

Total YAN to target for high YAN requiring strains = **Brix x 12.5**

- Fermentations prolonged using low temperatures (<12 C) will need about 20% extra YAN.
- YAN addition will be equal to the target YAN minus the available YAN
- The quantity of YAN added for AEB nutrients is available in the chart at the beginning of this chapter.
- To improve nutrient efficiency, divide the additions in two, one at the beginning and one at 1/3 of the fermentation.

Yeast derived nutrients (not containing DAP):

The combination of yeast derived nutrients, provides nitrogenous compounds in the form of amino acids (10%) and ammonia (0.8%), carbon, sulfur, trace nutrients, vitamin B complex and other important growth factors, such as unsaturated fatty acids and sterols, which are essential for the growth of healthy yeast. Their best time of addition is between start and 1/3 of fermentation to maximize yeast health, biomass and aromatic production. These nutrients contain a large amount of amino acids, the building blocks for higher alcohol and acetate esters. Their addition results in a predictable increased production of these aromatic compounds, alongside supporting vigorous fermentation.



Fermoplus DAP Free: natural nutrient derived from yeast lysis containing amino-acids, B vitamins and yeast hulls. Add at the beginning of the fermentation and halfway through. Later additions are still effective but with less impact. High alcohol and high DAP concentration will diminish assimilation of the amino acids contained in this product, so use it separately from DAP additions.

Usage: Dissolve in must or wine and add to the tank. It is preferred to add Fermoplus DAP Free in two steps, but it is most important at the beginning of the fermentation.

Dosage: standard addition is 25-40 g/hl (2-3 pounds/1,000 Gallons).

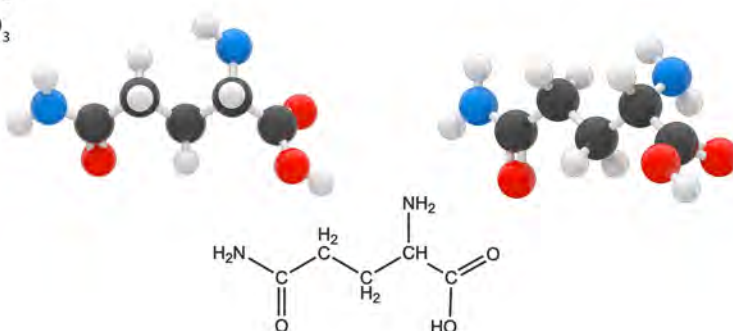
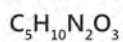
Shelf life and Storage: stable at room temperature for at least two years.

Packaging: 5, 10 and 25 kg bags.

Highlights:

- Rich in glutamine, a preferred nitrogen source, results in the short adaptation (lag phase) as well as a rapid exponential growth rate, large biomass formation and high aromatic expression.

Glutamine





Fermoplus Tropical: natural nutrient derived from yeast lysis containing amino-acids, vitamins and yeast hulls. Fermoplus Tropical is particularly rich in specific amino acids that are essential for the characterization of wines with an aromatic “tropical” profile. This nutrient allows to perceive more clearly these aromas, typical of varieties that naturally possess precursors, while its addition into different varieties facilitates the production of hints related to these notes. Add at the beginning of the fermentation and halfway through. Later additions are still effective but with less impact. High alcohol and high DAP concentration will diminish assimilation of the amino acids contained in this product, so use it separately from DAP additions.



Usage: dissolve in must or wine and add to the tank. It is preferred to add Fermoplus Tropical in two steps, but it is most important at the beginning of the fermentation.

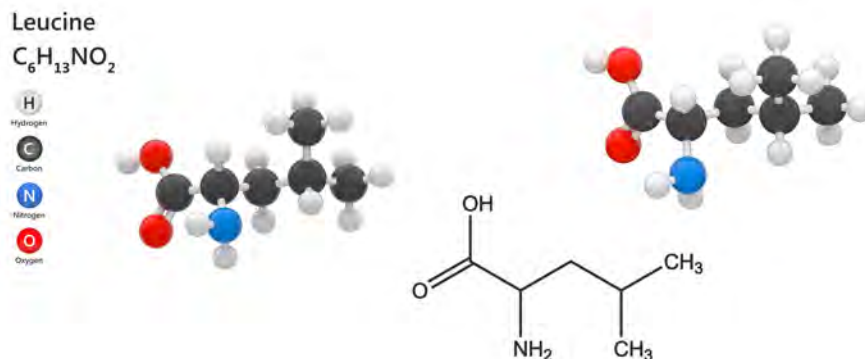
Dosage: standard addition is 25-40 g/hl (2-3 pounds/1,000 Gallons).

Shelf life and Storage: stable at room temperature for at least two years.

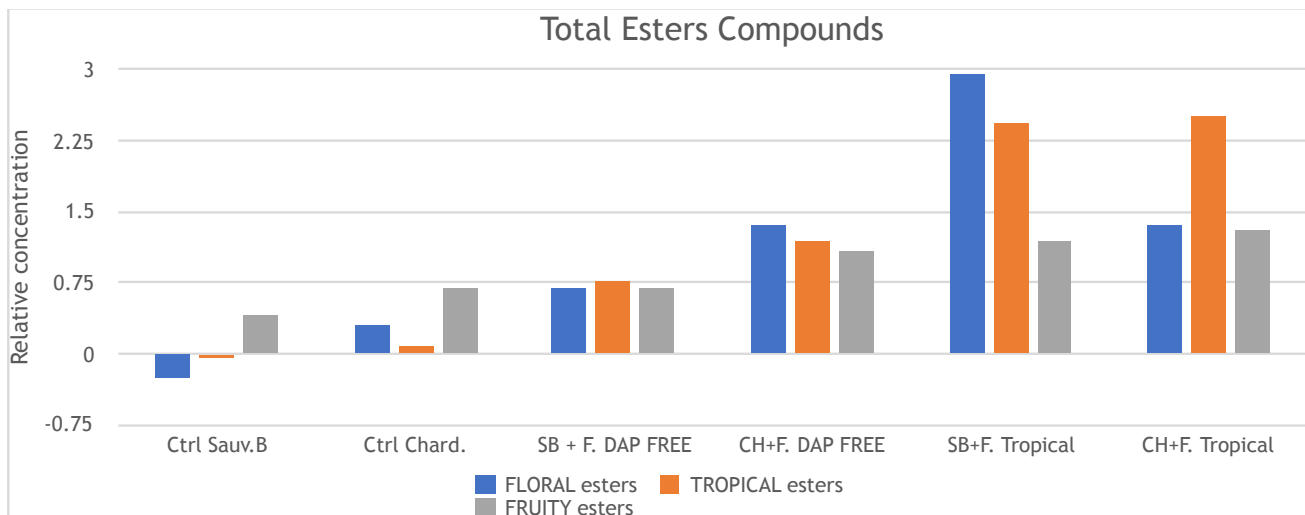
Highlights:

- Rich in Leucine and Isoleucine, low dose (2lbs/1000 gal) of Tropical already increases production of Isoamyl alcohol and Isoamyl acetate (banana), alongside ethyl propionate (apple) and ethyl butanoate (pineapple).
- It has been used very successfully to boost the fruity notes in “earthy” varieties like Shiraz and Nebbiolo.

Packaging: 5kg bags



AROMA	CTRL SAUV.B	CTRL CHARD.	SB + F. DAP FREE	CH+F. DAP FREE	SB+F. TROPICAL	CH+F. TROPICAL
FLORAL ESTERS	-0.24	0.3	0.7	1.35	2.94	1.35
TROPICAL ESTERS	-0.032	0.1	0.78	1.2	2.43	2.5
FRUITY ESTERS	0.41	0.7	0.69	1.1	1.19	1.3



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 relative concentration of esters and higher alcohol, grouped by aroma descriptors, of control wine/no addition, 3 lbs./1000 gal addition at the beginning of fermentation of Fermoplus DAP Free or Fermoplus 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 Floral: natural nutrient derived from yeast lysis containing amino-acids, vitamins and yeast hulls. Fermoplus Floral was developed by studying the amino acidic composition of floral varieties like Grüner Veltliner. It's indicated for white and rosé fermentations to highlight the aromatic profile. This nutrient allows to perceive more clearly floral aromas, typical of varieties that naturally possess precursors, while its addition into different varieties facilitates the production of hints related to these notes.



Add at the beginning of the fermentation and halfway through. Later additions are still effective but with less impact. High alcohol and high DAP concentration will diminish assimilation of the amino acids contained in this product, so use it separately from DAP additions.

Usage: dissolve in must or wine and add to the tank. It is preferred to add Fermoplus Floral in two steps, but it is most important at the beginning of the fermentation.

Dosage: standard addition is 25-40 g/hl (2-3 pounds/1,000 Gallons).

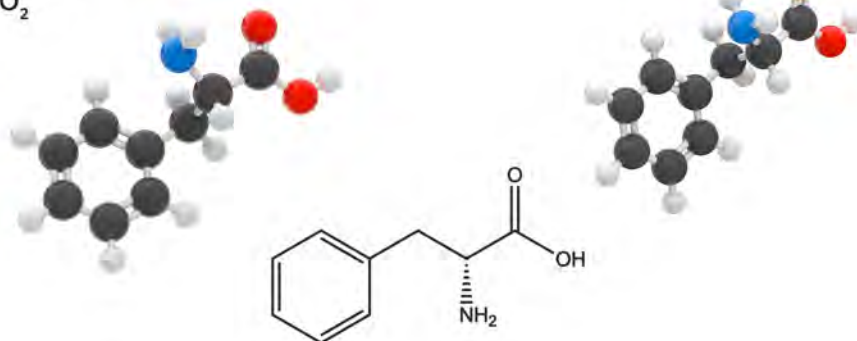
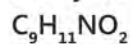
Shelf life and Storage: stable at room temperature for at least two years.

Highlights:

Rich in phenylalanine, low additions (200 ppm or 1.5 lbs/1000 gal) of Fermoplus Floral already increase production of 2-phenyl ethanol (roses, orange blossom) and 2 phenyl-ethyl acetate (honey scent) esters

Packaging: 5kg bags

Phenylalanine



NEW!

Fermoplus PyrOff: Methoxypyrazines (MPs) are compounds with very low sensory thresholds. They give the wine a “herbal” and “green pepper” character, resembling unripe grapes of Cabernet Franc/ Cabernet Sauvignon where it is naturally present in greater quantities.

Fermoplus PyrOff is made by yeast auto lysate and yeast cell wall with high adsorption capacity towards MPs. Its function is



based on the interaction between the lysate and the cell wall. The cell wall is essential for the adsorption and falling out of solution of MPs. Other than this added benefit, Fermoplus PyrOff provides organic nitrogen and therefore contributes to pleasant fermentative aromas increasing aromatic esters compounds.

Highlights:

The use of Fermoplus PyrOff right after pectolytic enzymes have finished their activity, causes the methoxypyrazines released from the skins to be immediately adsorbed and subsequently eliminated.

Available in 5 and 20 kg bags.

Complex nutrients:

Formulations that blend DAP, organic nutrients and thiamine hydrochloride to obtain the balance between high nitrogen addition and micronutrients (free amino acids, yeast hulls, unsaturated fatty acids, sterols, and micronutrients). Balanced nutrition produces stronger and healthier cells, while adding only nitrogen results in less aromas, faster cell death and higher risk of stuck fermentation.

Highlights:

Time of addition: complex nutrient can be used from the start and all the way through the 3/4 of the fermentation.

Why adding thiamine? Although *S. cerevisiae* can synthesize thiamin de novo, lack of exogenous thiamin in the medium leads to slow fermentation and may lead to sluggish or stuck fermentation.

PRODUCT	PERCENTAGE VIT B1	MAX LEVEL OF DOSAGE
FERMOPLUS INTEGRATEUR	0.06%	8.3 LBS/1,000 GALLONS (100G/HL)
FERMOPLUS PREMIER CRU	0.06%	8.3 LBS/1,000 GALLONS (100G/HL)
FERMOPLUS BLANC VARIETAL	0.06%	8.3 LBS/1,000 GALLONS (100G/HL)
FERMOPLUS ENERGY GLU 3.0	0.3%	1.6 LBS/1,000 GALLONS (20G/HL)
FERMOCEL P	0.1%	5 LBS/1,000 GALLONS (60G/HL)
ENOVIT P	0.2%	2.5 LBS/1,000 GALLONS (30G/HL)

Thiamine hydrochloride: According to TTB, Thiamine hydrochloride is used as a yeast nutrient to facilitate fermentation of wine. The amount used shall not exceed 0.005 lb./1000 gals. (0.6 mg/L) of wine or juice. 21 CFR 184.1875 (GRAS). The values in the chart are our suggestions. AEB cannot be accounted responsible for violating TTB rules.



Fermoplus Integrateur: complex nutrient based on DAP and yeast lysate.

It has a

high NH₄ 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, micro elements and sterols to keep the yeast healthy. It also contains 0.06% thiamine hydrochloride*

Usage: Dissolve in must or wine and add to the tank. It is preferred to add Fermoplus Integrateur in three steps, but it is most important at the beginning of the fermentation.

Dosage: an addition of 120 ppm (12g/hl or 1lb/1000 Gallons) yields about 18 ppm of YAN. We recommend 2 lbs./1,000 gallons divided in 2-3 additions.

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

Highlights:

It helps exploit yeast performance and aroma characteristics in every fermentation, even the most critical.

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

Fermoplus Blanc Varietal: an upgraded version of Fermoplus Integrateur geared for enhancing the varietal qualities of white wines. It is rich in both amino acidic and mineral N and it also contains specific components like casein, natural antioxidants and amino acids in order to guarantee the development of enhanced aromatics during fermentation. Like all the Fermoplus line it also contains thiamine (0.06%) *.

Usage: Dissolve in must or wine and add to the tank. It is preferred to add Fermoplus Blanc Varietal in three steps, but it is most important at the beginning of the fermentation.

Dosage: an addition of 120 ppm (1lb/1000 Gallons) yields about 13 ppm of YAN. We recommend 2lb/1,000 gallons divided in 2-3 additions.

Packaging: 5 kg bags.

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

Fermoplus Premier Cru: an upgraded version of Fermoplus Integrateur geared for enhancing the varietal qualities of red wines. Rich in ammonia and natural amino acids, like the all Fermoplus line it also contains thiamine, natural mannoproteins, and B vitamins.

Usage: Dissolve in must or wine and add to the tank. It is preferred to add Fermoplus Premier Cru in three steps, but it is most important at the beginning of the fermentation.

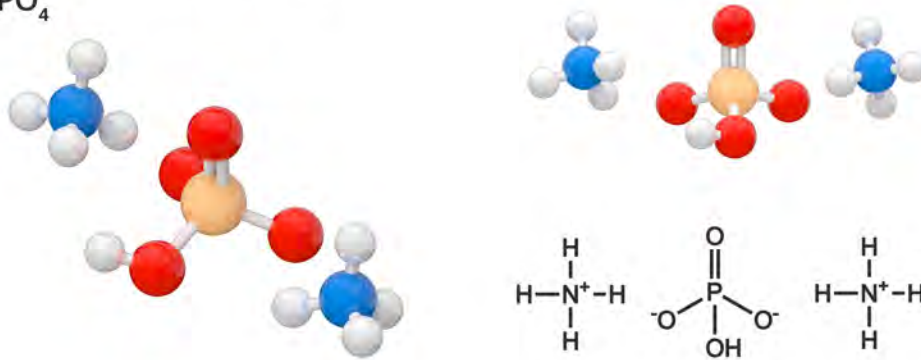
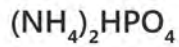
Dosage: an addition of 120 ppm (1lb/1000 Gallons) yields about 14 ppm of YAN. We recommend 2lb/1,000 gallons divided in 2-3 additions.

Packaging: 5 kg bags.

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

Inorganic nutrients:

Diammonium phosphate (DAP)



Blend of DAP & thiamine hydrochloride, pure cellulose or DAP & thiamine hydrochloride & cellulose, to provide nitrogen supply or/and detoxify the must/wine.

Time of addition: inorganic nutrients can be used from the start of fermentation to 8° Brix.

Enovit P: Mainly composed of nitrogen salts of DAP with added Thiamin. It brings a large amount of ammonia (NH₄) for a quick boost of the YAN (yeast available nitrogen). Utilized at 30 g/hl (300 ppm) it brings 60 ppm of YAN (about 20%). The added Thiamine helps to promote a shorter lag-phase and to avoid the formation of ketonic acids that can combine SO₂ and diminish its efficiency. The average YAN yield for a 120 ppm (1lb/1000 Gallons) addition of Enovit P is 24 ppm.

Dosage: standard additions are in the range of 12-36 g/hl (1-3 pounds/1,000 Gallons).

Packaging: 25 kg bags.

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

Highlights:

Staggered nitrogen additions at the beginning and 1/3 fermentation proven to be useful for faster fermentation.

Fermocel P: nutrient/bio-regulator widely used in Europe in white and rosé wine juice fining is pushed to the extreme and musts need some haze to ferment properly. The cellulose contained in Fermocel P helps with yeast nucleation, adsorption of toxins and long chain fatty acids. Nitrogen salts (DAP) bring a large amount of ammonia nitrogen that immediately raises the YAN level. It creates the perfect environment for fermentation of juices that are extremely clarified, like white musts, fruit wines, ciders or meads. The neutral dispersing agents in the mix provide support for the yeast cells to be homogeneous in the all fermentation vessel. The average YAN yield for a 120 ppm addition (12g/hl or 1lb/1000 Gallons) is about 12 ppm.

It also contains thiamine hydrochloride.

Dosage: standard addition is 12-36 g/hl (1-3 pounds/1,000 Gallons)

Packaging: 25 kg bags.

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

Celloferm: a bio-regulator in powdery form, based on very pure celluloses with long polysaccharide chains. It absorbs the substances inhibiting or slowing down the yeast activity and rapidly activates fermentations.

The addition of Celloferm to the clear must facilitates the yeast in the lag-phase, especially in musts where the sugar concentration is very high, or where environmental conditions are very difficult. It acts on the must by binding to the residues of plant protection products, such as fungicides, acaricides, and copper-based products. The composition of Celloferm enables the interaction with positive metal ions, as the cellulose is negatively charged and binds with positive ions, such as Fe^{+++} and Cu^{++} . Under this aspect, it contributes to reduce the oxidative effects caused by these elements.

Furthermore, the long-chained celluloses carry out an adsorption action towards metabolites yielded by the yeasts during fermentation and fix toxic fatty acids and their ethyl esters, granting a regular and constant run. Celloferm has a high support action during fermentation, as it facilitates the homogeneous dispersion of the yeasts in the mass.

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

Dosage: 120-240 ppm (12-24 g/hL or 1-2 lb./1,000 gallons).

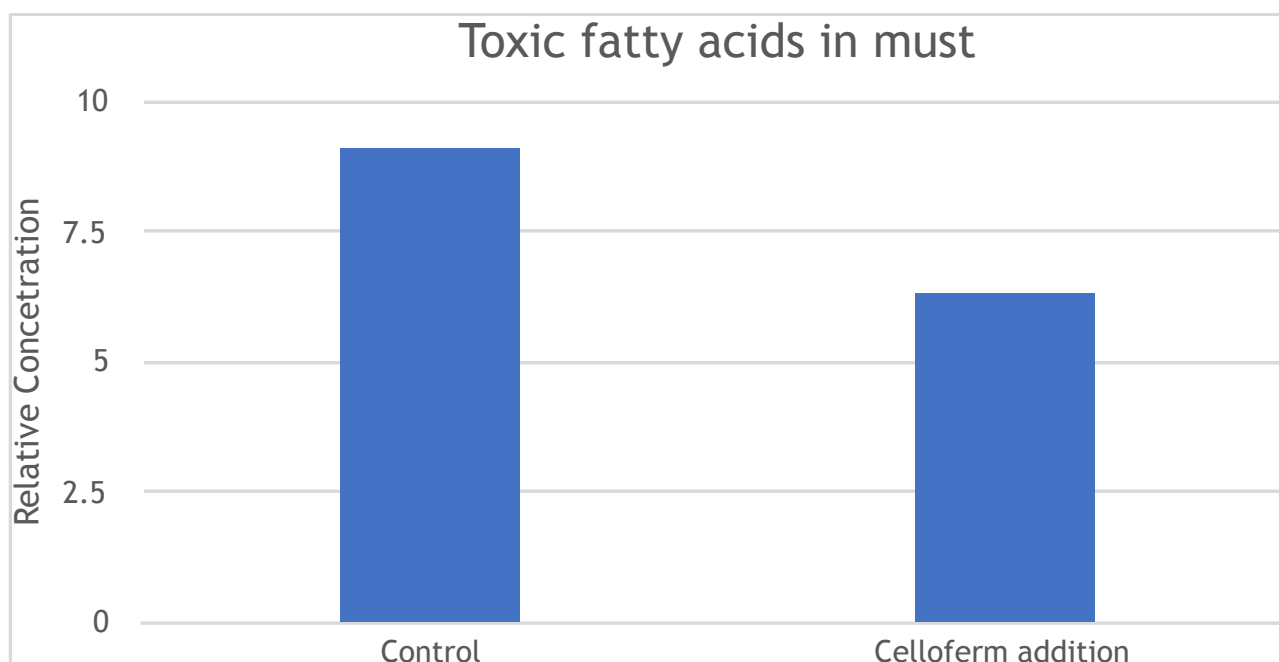
Shelf life and storage: sealed containers will last for 2 years stored at room temperature in a non-humid environment.

Highlights:

To improve fermentation kinetics by adsorbing toxins and long chain fatty acids that inhibit the yeast during fermentation. Also, the cellulose is going to work as a nucleation media: a “boat” for the yeast cells so they can stay well suspended in the fermenting must. This is crucial especially in cold fermentation, when the activity is quite slow and there is little CO₂. In these conditions certain yeast can flocculate, and bacteria take over in the upper part of the tank, causing VA production and sluggish fermentation.

Packaging: 10 kg bags.

	CONTROL	CELLOFERM ADDITION
SHORT CHAIN FATTY ACIDS	9.1	6.3



Inhibiting toxic compounds, such as short and medium chain fatty acids (SMCFA) or pesticides residues (fungicide, herbicide, insecticide) have been widely investigated for their inhibition of alcoholic fermentation. Recent studies also showed that they can negatively impact the production of aromas (namely esters) and the wines fruit character (Noguerol-Pato et al., 2014). Graph shows relative concentration of SMCFA with no addition/control or after addition of 1 lb/1000 gal of cellulose at the end of AF.

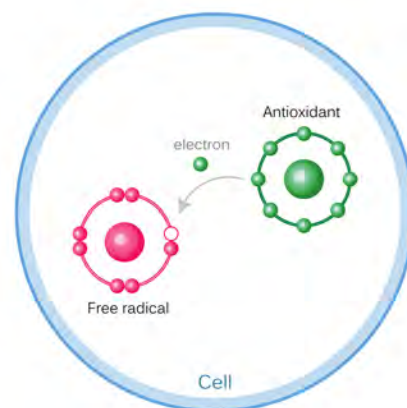
Rehydration nutrient:

Proper yeast rehydration is one of the most important steps to help ensure a strong and healthy fermentation. During rehydration the cell tends to absorb water rapidly. At first water diffusion can damage the intracellular structures, compromising the cell machinery and possibly leading to cell death. A severe rehydration process can result in a total loss of viability. Addition of nutrients in the rehydration phase shows positive effect to counteract the osmotic stress, decreasing the permeability of the cytoplasmic membrane. Nutrients are quickly metabolized inside the cell, stimulating the production of protein to repair the intracellular organelles, ensuring the fermentation starts faster and with an increased number of cells. Initial water temperature between 95-100° F/35-38° C is the optimal target for the rehydration of *Saccharomyces cerevisiae* dry yeast. Ask your AEB specialist about Reactivateur, an automated vessel for the rehydration and acclimation of dry yeast.



Fermoplus Energy Glu 3.0: booster for the yeast biomass, to be added in the rehydration tub. It accelerates multiplication speed improving the biomass. This ultimately facilitates dominance of the selected yeast strain. Ammonia (NH_4^+) and amino-acids, are the predominant nitrogen-containing compounds that are utilized by the *Saccharomyces*. GAP (General Amino Acid Permease) transports several amino acids inside the yeast cell but is inhibited by NH_4^+ .

It is therefore active when the must is depleted of ammonium ions, or before the yeast is inoculated into the must. For this reason, it is important to feed amino acids in the rehydration tub, in absence of NH_4 , using Fermoplus Energy Glu 3.0. The purity of the extract in terms of amino acids it's geared to be immediately and fully absorbed by the yeast cell, resulting in an addition rate much lower than the most re-hydration nutrients available.





Scan the code to learn more about AEB rehydration nutrient and how it can help you to improve your fermentation.

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

Dosage: 1:4 compared to yeast inoculum. i.e. 25 grams/hL of yeast will need 6 grams/hL of Fermoplus Energy Glu. 2lb/1000 Gallons of yeast will need 1/2 lb. of Fermoplus Energy Glu.

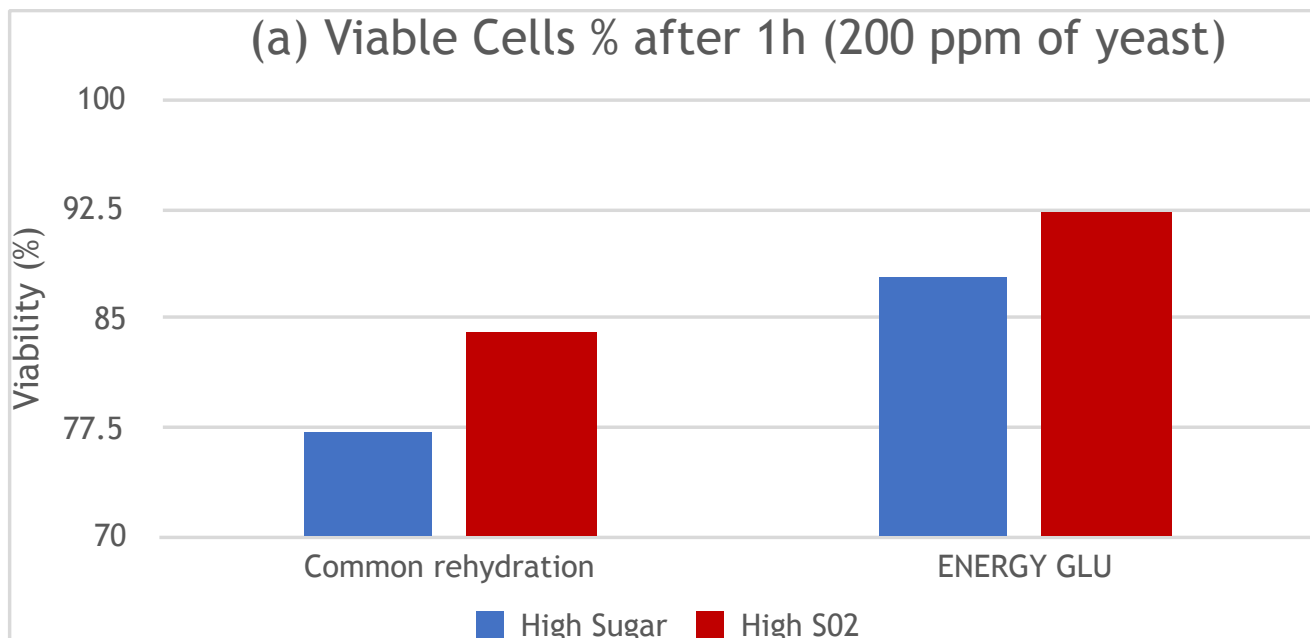
Packaging: 1kg, 5 kg & 20 kg bags.

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

Highlights:

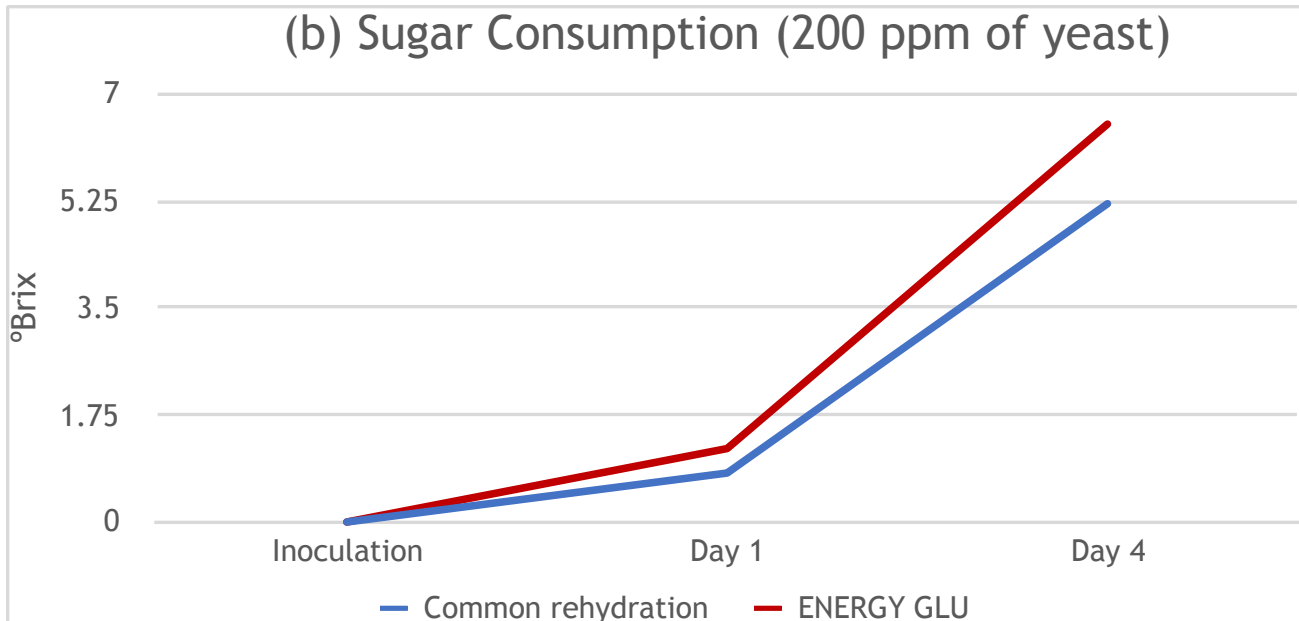
- Why Glutathione during rehydration? Glutathione is a natural antioxidant that the yeast uses to protect its organs from free radicals and to ensure that yeast cells are not damaged by the high oxidative activity existing during rehydration. When cells are dry, they don't have an immediate availability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

DAYS	COMMON REHYDRATION	ENERGY GLU
INOCULATION	0	0
DAY 1	0.8	1.2
DAY 4	5.2	6.5



(a.) Cell viability after 1h rehydration procedure, control versus AEB protocol with Energy Glu, in two different musts (inoculated at 200 ppm of dry yeast).

CONDITION	COMMON REHYDRATION	ENERGY GLU
HIGH SUGAR	77.2	87.9
HIGH S02	84.1	92.3

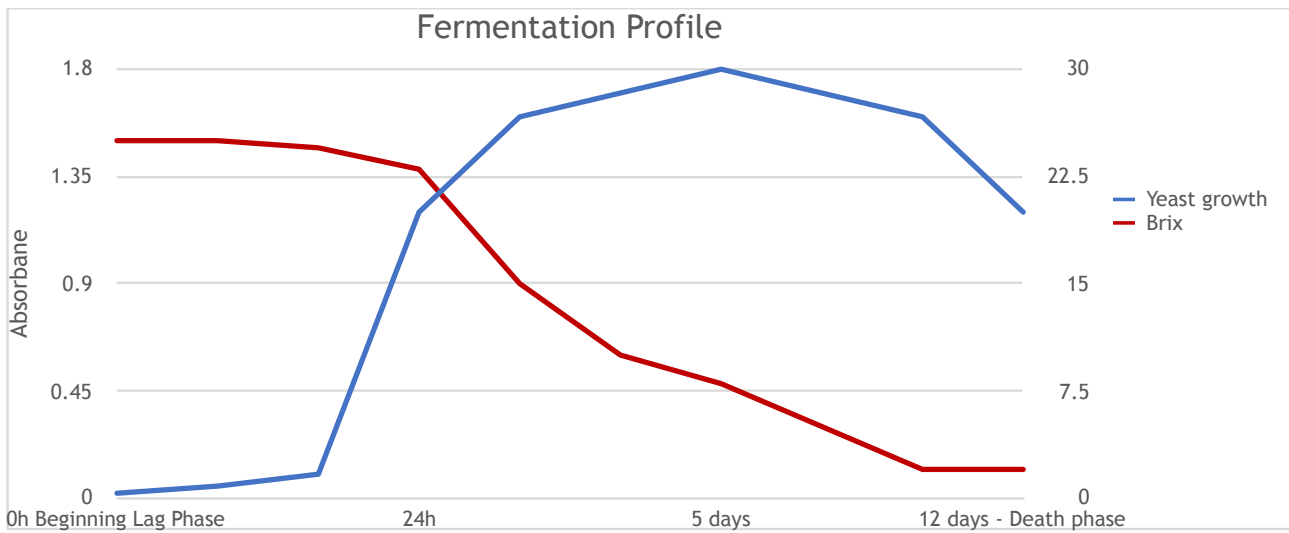


(b.) Cell vitality, measured by sugar consumption, in must (250 g/L sugars, 50 ppm S02, 200 ppm of yeast).

Healthy fermentations have a lower risk of getting stuck

During fermentation, yeast take up and metabolize amino acids and other nutrients to support growth and to produce biomass. In the process, a range of volatile aroma compounds, including esters, higher alcohols, volatile fatty acids, carbonyls and sulfur compounds are produced. The production of many of these aroma impact compounds is directly dependent on the nitrogen sources that are present during fermentation. Latest scientific investigation showed yeast needs more than nitrogen in order to conduct a healthy and a complete fermentation. In particular, the nutrient addition needs to be tailored to the yeast physiological state: lag phase, exponential phase, stationary phase, death phase. The final aim is to promote a vigorous and aromatic fermentation and avoid early death phase which correlates with sluggish and stuck fermentation.

TIME	YEAST GROWTH	BRIX
0H BEGINNING LAG PHASE	0.02	25
6H	0.05	25
12H BEGINNING LOG PHASE	0.1	24.5
24H	1.2	23
36H BEGINNING STATIONARY	1.6	15
48H	1.7	10
5 DAYS	1.8	8
7 DAYS	1.7	5
10 DAYS	1.6	2
12 DAYS - DEATH PHASE	1.2	2



Yeast growth and sugar consumption during fermentation.

1. Lag phase: is a phase during which the yeast become acclimatized to the must and prepare to bud and consume sugars. We recommend Energy Glu 3.0 in rehydration in order to insure yeast performance during this phase.

2. Log/exponential phase: is a time of exponential growth of the yeast culture. Nitrogen, amino acids, nutrients, and sugar are consumed while the cells are reproducing. Many of the significant aromatic and flavor compounds are by-products of this cell growth and are produced at this stage. We recommend 20-30 grams of DAP free nutrients (DAP Free, Tropical, Floral or Pyr-Off), right after inoculation.

3. Stationary phase: is the last stage where the yeast population reaches maximum density and the remaining sugars are consumed. As the available sugar and Nitrogen decreases, the yeast begin to prepare for a period where there is a lack of food.

We recommend targeting your YAN with DAP containing nutrients early on (e.g. Fermoplus Integrateur, Fermocel and Envois P), in one or two staggered additions at 1/4 fermentation and 1/2 of the fermentation.

CHAPTER THREE

ML Secondary Fermentation

Malolactic Bacteria

Malolactic fermentation (MLF) is an intricate process in which specific bacteria converts malic acid (two carboxylic group) into lactic acid (one carboxylic group) This translates in less H⁺ being released in the media by lactic, therefore a higher pH. and a lower total acidity.

By inoculating with an AEB starter culture, which contain *O. oeni* as a single strain or mixed cultures, the winemaker can reduce the risk of potential spoilage bacteria or bacteriophages, promote the rapid start and completion of MLF and encourage a positive flavor contribution. AEB Malolact *Oenococcus oeni* strains are best adapted to the harsh wine environment, including conditions of:

- High alcohol
- Low pH
- Presence of sulfur dioxide (50 ppm of SO₂)
- Extreme temperature
- High concentration of phenolic compounds

PRODUCT	NUMBER OF STRAINS	TYPE	CHARACTERISTICS	PACKAGING	DOSAGE
MALOLACT ACCLIMATÉE	3 STRAINS COMBINED, TO BUILD A DOMINANT "COCKTAIL"	DIRECT ADD	FOR CLEAN AND CONSISTENT ML FERMENTATION	2.5 GRAMS (BARREL SIZE), 25 GRAMS, 250 GRAMS, 1 KG	1 GRAM PER 1 HL OR PER 26 GALLONS
MALOLACT ACCLIMATÉE 4R	4 STRAINS COMBINED, TO BUILD A DOMINANT "COCKTAIL" WITH SPECIAL RESISTANCE TO HIGH PHENOLICS.	DIRECT ADD	FOR COMPLICATED ML FERMENTATIONS (HIGH ALCOHOL AND HIGH TANNINS)	2.5 GRAMS (BARREL SIZE), 25 GRAMS, 250 GRAMS	
MALOLACT ACCLIMATÉE F	SINGLE STRAIN	DIRECT ADD	FAST AND CONSISTENT ML FERMENTATION	1 KG	
FERMOPLUS MALOLACTIQUE AF	NUTRIENT FOR MALOLACTIC BACTERIA	YEAST DERIVED NUTRIENT	REINTEGRATES THE FERMENTING MEDIA WITH YEAST DERIVED AMINO-ACIDS AND VITAMINS	500 GRAMS PACKETS AND 5 KG BAGS	200 PPM (ABOUT 1.5 LBS/1,000 GALLONS)



Malolact Acclimatée: frozen culture at -20°C . Multi strain direct inoculum of *Oenococcus oeni* for malolactic fermentations. Malolact Acclimatée is ideal for white, rosé and red wines. It's constituted of three genetically different strains of *Oenococcus oeni*, equally effective in conducting the malolactic fermentation. This combination helps to improve competition in the event of a high population of indigenous bacteria. Malolact Acclimatée has been selected for its capacity to highlight the typical aromas of the cultivar from which the wine was made, integrating them with pleasant fruity nuances. It improves the taste profile of wines enhancing roundness and fullness and prolonged after taste sensations. The appearance of bitter or green nuances, which often characterize wines at the end of spontaneous malolactic fermentation, are absent.

Utilization: remove Malolact Acclimatée from the freezer 30 minutes before use. Malolact Acclimatée works as a direct add, but its activity can be boosted by a simple rehydration for 24 hours (see procedure at the end of this chapter).

Dosage and packaging: add 10 ppm 1g/hL. Comes in pre-dosed packets for 66 gal, 660 gal, 6,600 gal, or 26,400 gal of wine (2.5 grams, 25 grams, 250 grams and 1 kg).

Storage and shelf life: Malolact Acclimatée is stable for two years (with minimal loss of activity), when stored in a freezer (-4°C / -17°C).

Malolact Acclimatée 4R: frozen culture at -20°C . Multi strain direct inoculum of *Oenococcus oeni* for malolactic fermentations. Malolact Acclimatée 4R is a direct add ML inoculum ideal for big red wines and harsh ML conditions.

In this product "coexists" an aggregate of four *Oenococcus oeni* strains, especially selected for working in red wines characterized by high phenolics. When developing this culture, the selection has been mostly focused on having a strain not only resistant to ethanol and SO_2 , but also to high levels of tannins. Malolact Acclimatée 4R has been selected under the following conditions: pH: 3.2; Temperature: 18°C ; Alcohol level: 14.5%; Total SO_2 60 ppm; concentration of polyphenols: 80 (by total polyphenol index).

Utilization: remove Malolact Acclimatée 4R from the freezer 30 minutes before use. It works as a direct add, but its activity can be boosted by a simple rehydration for 24 hours.

Dosage and packaging: add 10 ppm or 1g/hL. Comes in pre-dosed packets for 66 gal, 660 gal, 6,600 gallons of wine (2.5/25/250 grams and 1 kg).

Storage and shelf life: the lactic bacteria's activity of Malolact Acclimatée 4R is stable for two years (with minimal loss of activity) when stored in a freezer (-4°C /-17°C).

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, given the conditions of the wine. 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.

Utilization: Remove Malolact Acclimatée F from the refrigerator 15 minutes before use. Malolact Acclimatée F works as a direct add, but its activity can be boosted by a simple rehydration for 24 hours.

Dosage: dose at 1g/hL. 1 kg pack is good for 26,400 Gallons.

Storage and shelf life: the lactic bacteria's activity of Malolact Acclimatée F is stable for two years (with minimal loss of activity) when stored in a freezer.

Packaging: 1 kg Pre-dosed packets for 26,400 Gallons of wine.

	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 SO2	<8	10-12	12-15	>15
TOTAL SO2	<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

Co-Inoculation yeast/bacteria

Bacteria inoculated in wine at the end of alcoholic fermentation face difficult conditions, such as high ethanol content combined with low pH, these conditions threaten their survival. In contrast inoculation in grape must allows the bacteria to adapt gradually to ethanol before it becomes toxic for the cell. This way ML is substantially facilitated. However, there is still skepticism on co-inoculation due to the risk of increased VA and competition with the yeast.

In most cases, *Oenococcus oeni* is an hetero-fermenter that will create multiple end-products from the utilization of glucose with D-lactic acid and CO₂ being produced in roughly equal amounts to either ethanol or acetate. In reductive conditions, like at the end of fermentation, the third product is usually ethanol, while in slightly oxidative (such as early in alcoholic fermentation or in an un-topped barrel) the bacteria is likely to produce acetate (VA).

Regarding competition for nutrition, Lactic acid bacteria have limited biosynthetic ability, therefore require pre-formed amino-acids and B-vitamins. During co-inoculation, is important to provide amino-acids to the yeast for optimizing biomass formation. An ideal timing for this would be during yeast rehydration, using Fermoplus Energy Glu 3.0 and during fermentation using Fermoplus DAP Free.

Highlights:

- We recommend to wait the end of yeast lag-phase before adding the Malolact of choice.
- Temperature should never reach 30 degrees Celsius.
- Regarding SO₂, the lower the better. 50 ppm might be added, provided that the bacteria addition happens at least 12 hours after KMS addition.
- Depending on the SO₂ level, <50 ppm or >50 ppm, we recommend co-inoculation after 24 or 48 hours respectively.
- Also, the SO₂ produced by the yeast can play a role in slowing bacteria down. The chart: "Selection of AEB yeast for the co-inoculum", shows experiments done with some of our yeasts in co-fermentation with ML bacteria.

YEASTS	SO ₂ PRODUCTION	ML/YEAST CO-INOCULATION
FERMOL ARÔME PLUS	•••	NOT RECOMMENDED
FERMOL ELEGANCE	••	OK
PB 2013	••	OK
GLUTAFERM ONE	•••	OK
FERMOL RED FRUIT	•	RECOMMENDED
FERMOL BLANC	••	OK
FERMOL CRYOFRUIT	•	RECOMMENDED
FERMOL ROUGE	••	OK
FERMOL COMPLET KILLER FRU	••	OK
FERMOL PREMIER CRU	•	RECOMMENDED
FERMOL PB2033	•••	NOT RECOMMENDED
FERMOL CHARMAT	•••	NOT RECOMMENDED
FERMOL SAUVIGNON	••	OK
FERMOL CHARDONNAY	••	OK
FERMOL MEDITERRANEE	••	OK

Selection of AEB yeast for the co-inoculum with ML Bacteria.

How to increase Buttery (Diacetyl) flavor

AEB's Malolact Acclimatée *Oenococcus oeni* bacteria can produce none or considerable Diacetyl depending on conditions. One variable that can boost this buttery aroma component is citric acid paired with oxygen. Biosynthesis of Diacetyl is dependent on the citric acid metabolism and the fact that under partially aerobic conditions, Malolact strains convert citric acid into Diacetyl. Citric acid is first degraded to acetic acid and pyruvic acid. Most of the pyruvic acid is then metabolized to lactic acid with a portion going to diacetyl, acetoin, and 2,3-butanediol. In anaerobic conditions the pathway will favor formation of acetoin and butanediol. This is because the formation of diacetyl requires an oxidative reaction.



- According to our research, additions of 1 gram per liter 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 Malic acid is all depleted and will be diminished by the presence of SO₂. If diacetyl is desired it is better to wait a few days after completions of MLF before SO₂ 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 cell 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.

How to save money on ML bacteria by propagation

Direct add bacteria can be added directly pouring the acclimated bag into the wine, or can be propagated in order to increase population and efficiency. Here is a procedure that can benefit all kinds of direct add ML Bacteria:

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 Malolact of 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.

ML Nutrition

Fermoplus Malolactique: Malolactic bacteria are typically nutritionally demanding. To grow and develop they need amino acids and vitamins, which are rarely present in the fermented wine, as yeasts tend to deplete them completely. Fermoplus Malolactique re-balances nutritional conditions and reduces the lag-time for the start and completion of the malolactic fermentation. The inoculation of malolactic bacteria with the support of Fermoplus Malolactique, at the end of primary fermentation, helps the onset of MLF. Using Fermoplus Malolactique to improve nutritional conditions results in successful malolactic completion and cleaner wines.

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

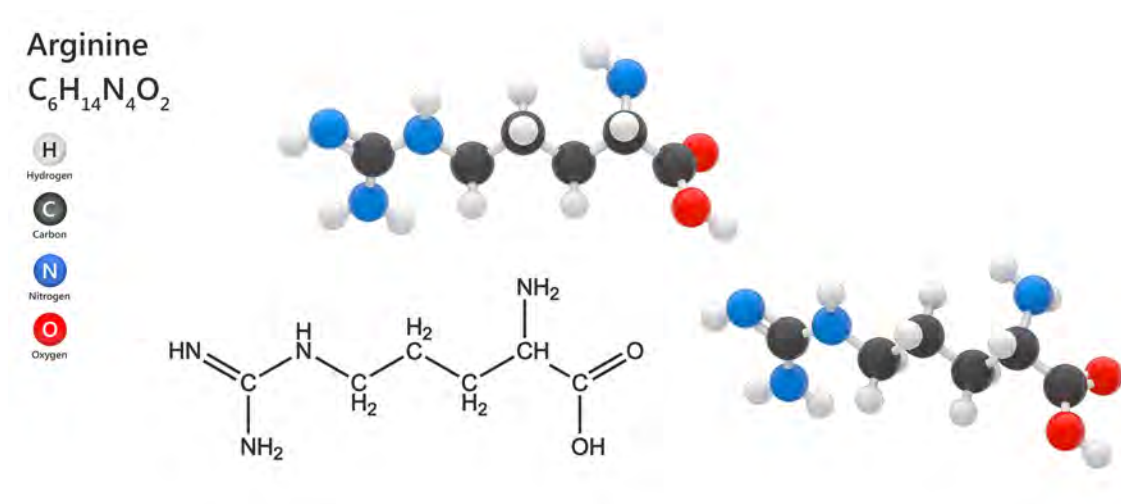
Dosage: 50-200 ppm (5-20 grams/hl or 0.5-1.5 lb/1000 gallons). Higher dosage is for when used in co-inoculation early on.

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

Highlights:

Rich in Arginine, which raises the production of ATP (Energy).

Packaging: 500 grams packs and 5 kg bags



CHAPTER FOUR

**Enzymes for
wines & ciders**

ENZYME	TYPE	ACTIVITY	DOSAGE
PECTINASES FOR MUST CLARIFICATION			
Endozym Active	Granular pectinase enzyme	To break down pectins before must settling or flotation	20-40 grams per ton of grape
Endozym Flotation	Liquid pectinase enzyme for must clarification through flotation or cold settling	Fast acting, it promotes the hydrolysis of the pectins and the separation of juice from the pomace	5-10 ml per ton of grapes (5.75 - 11.5 grams per ton)
Endozym Ice	Extra rapid liquid pectinase enzyme	Very fast de-pectinization that also prevents the inhibition of limiting factors like cold, low pH or SO ₂	2-6 ml per ton of grapes (about 2.3-6.9 grams per ton)
Endozym ICS 10 Éclair	High concentration liquid pectinase enzyme	The higher concentration guarantees a longer shelf life & makes the package very easy to store in a small, refrigerated space.	1.5 to 5 ml per ton of grapes (about 1.7-5.75 grams/ton)
Endozym Micro	Liquid pectinase enzyme	Promotes the hydrolysis of the pectins and the separation of juice from the pomace, resulting in an increase of free-run juice yield	2-6 ml per ton of grapes (about 2.3-6.9 ml per ton)
Endozym Muscat	Granular pectinase for "harder to clarify" varieties	Arabanase and rhamnosidase are key ingredients that allow Endozym Muscat to quickly de-pectinize the most challenging varieties	20-40 grams per ton of grape
AROMATIC COLD MACERATION ENZYMES			
Endozym Cultivar	Granular enzyme for cold maceration of white grapes	Used at the press or added to the must going to the cold maceration tank. It weakens the cell walls in the pulp facilitating aromas extraction	20-40 grams per ton of grapes
COLOR ENZYMES			
Endozym Contact Pelliculaire	Granular maceration/color-extraction enzyme	Facilitates the dissolution of anthocyanins and improves tannin extraction from skins	20-40 grams per ton of grapes
Endozym ICS 10 Rouge	Liquid maceration-color extraction concentrated enzyme	Allows must to penetrate the cellular walls, enabling rapid color and phenolic extraction	1 to 3 ml per ton of grapes (1.15-3.45 grams/ton)
 Endozym Rouge deep skin	To extract color and minimize lees in varieties with thicker skin	Reduces maceration times and the need for excessive pump overs.	10 ml per ton of grapes
 Endozym Rouge light skin	To extract color and minimize lees in varieties with thinner skin	Allows to maximise the concentration of polyphenols and varietal aromas of varieties with thinner skins	10 ml per ton of grapes

ENZYME	TYPE	ACTIVITY	DOSAGE
AROMA AND GLUCANASE ENZYMES			
Endozym Antibotrytis	Mix of various activities including glucanase to reduce impact of Botrytis cinerea and mold in general	Reduces the PPO laccase released from botrytis and responsible for molded wine oxidation. Also reduces excessive glucans.	30-50 grams per ton of grapes or 20-40 grams per hl of wine (1.5-3 lbs./1,000 gallons)
Endozym β -Split	Granulated Beta-Glucosidase specific for aroma extraction	Beta-Glucosidase for aroma enhancement	2- 5 grams per Hl or 20-50 ppm
Endozym Thiol	Liquid carbon-sulfur lyase	It favors the hydrolysis of the thiols precursors and enhances their expression in the wine	20-40 ml (23-46 g) per ton of grape, or 20-40 ppm on must
Endozym Glucapec	Glucanase/Pectinase	To facilitate filterability in wines rich in glucans and to extract polysaccharides from lees	2 to 4 g/hl or 20-40 ppm or 1/3 lb/1,000 gallons
FLASH-DÉTENTE TECHNOLOGY AND THERMO			
Endozym TMO	Pool of enzymatic activities	For the clarification of heat extracted musts.	20-40 ppm
APPLE ENZYMES			
Endozym Alphamyl FJ	α -amylase enzyme for the clarification of cider and perry	To avoid possible starch related haze and to facilitate ultra filtration	2-6 ml/100Kg of apples at 45-50°C. Contact time 60 minutes. If heat isn't available, use 20ml/100Kg and double the contact time
Endozym Pectofruit PR:	Cellulase for increasing yield and help clarification of cider and perry	Insures total degradation of the fruit structure before pressing	30 ml/100Kg of apples at °C. If heat isn't available use 70 ml/100Kg

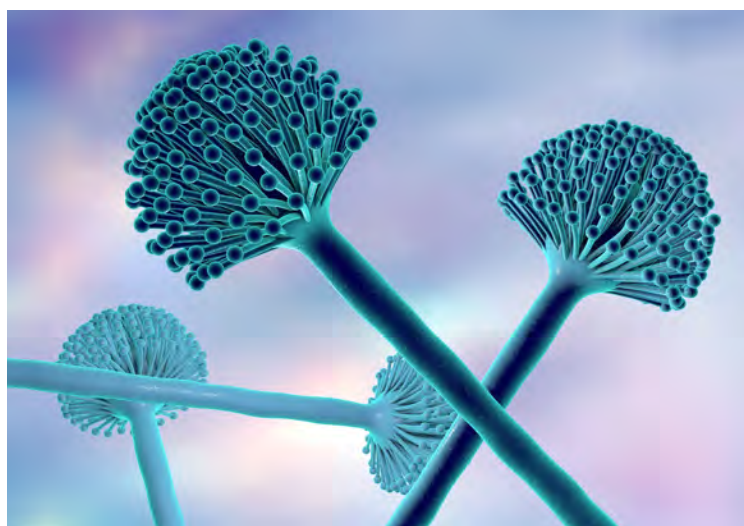
Enzymes are used in modern wine technology for various biotransformation reactions from pre to post-fermentation and wine aging. Industrial enzymes offer quantitative benefits (increased juice yields), qualitative benefits (improved color extraction and flavor enhancement) and processing advantages (shorter maceration, settling and filtration time).

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

- PL-Pectinlyase and PG-Polygalacturonase: pectin, responsible for must viscosity, slow down clarification.
- CMC-Cellulase: hemicellulose, hinders the release of anthocyanins and noble skin tannins.
- Beta-glucosidase: glucosides compounds, combination of some aromatic precursors (e.g. terpenes) and sugars.
- Glucanase facilitates glucans, Arabanase: polysaccharides, Acid Protease: proteins (Laccase), Carbon-sulfur lyase: thiol precursors.

Pectinases for winemaking:

The grape cell wall consists of cellulose microfibrils linked together by a matrix of xyloglucan, mannan, xylan (hemicellulose) and pectin, all of which is stabilized by a protein network. The high viscosity of pectin, which is dissolved after berry crushing impedes juice extraction, clarification and filtration. In addition, pectin prevents diffusion of phenolic and aroma compounds into the must during wine fermentation. Pectolytic enzymes break down the cell walls tissues and release juice easier by hydrolyzing the polysaccharides of the grapes. The most popular technological processes used to achieve must clarity normally are must settling and flotation. Clear musts translate in fruitier wines, with finer more stable aromatics, whereas musts rich in solids may



Aspergillus niger

carry bigger protein instability, heavy aromas, vegetal characters, bitter flavors and an important phenolic fraction that can negatively affect color and reductive smells.

The use of Endozym in must clarification, shortens settling time, increases the yield of must free run juice. In addition, it causes cloud particles to aggregate into larger units that deposit as sediment. The acceleration of the clarification process also produces more compact lees.

Highlights:

- Studies made at University of Reims, showed that at the recommended dosage and temperature (53-125°F/12-50°C) AEB enzymes took only 1 hour to deplete >90% of the pectin.
- Pectinases used in winemaking are derived from *Aspergillus niger* (picture) and can have both positive and negative side activities. Selecting the right media for growing the *Aspergillus* culture, is crucial to produce the right enzyme and have the most natural impact in the quality of the wine.

ODORS ASSOCIATED WITH TURBIDITY					
BY-PRODUCT	DESCRIPTOR	120 NTU	250 NTU	500 NTU	SENSORY THRESHOLD
2-MERCAPTO-ETHANOL	MERCAPTAN	113 PPB	140 PPB	179 PPB	130 PPB
3-METILTIOPTOPIONIC ACID	BOILED POTATOES	85 PPB	178 PPB	310 PPB	50 PPB
METHYL-2 TETRAHYDRO-THIOPHENON	CABBAGE	102 PPB	131 PPB	191 PPB	70 PPB
METHIONOL	MUSHROOM	1,097 PPB	1,958 PPB	3,752 PPB	1,200 PPB

Clear musts translate in fruitier wines, musts rich in solids may carry bigger protein instability, heavy aromas, vegetal characters, bitter flavors and an important phenolic fraction that can negatively affect color and reductive smells.

Endozym Active: granular pectinase enzyme to be used to break down pectin before must settling or flotation. It promotes the hydrolysis of the pectic chains, facilitating the drainage of juice from pomace and yielding higher free-run juice as a result of its pectolytic and polygalacturonasic action.

Clarification of musts and wines is significantly accelerated, also resulting in more compact lees. As a result of a cleaner must, the wine will have cleaner aromas, less unstable proteins and it will be easier to filter.

Utilization: dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes. The activity of Endozym Active is reduced by lower temperatures. If the grapes aren't too rich in phenolics, the product can be added directly into the receiving line, thus allowing for good contact time with must before refrigeration. Precaution needs to be taken in order to avoid the contact between the enzyme and high dosage levels of SO₂ or bentonite.

Dosage: 20-40 grams per ton of grape depending on contact time, temperature and SO₂ content.

Shelf life and storage: Endozym Active 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 Flotation: liquid pectinase enzyme for must clarification through flotation or cold settling. To carry over the flotation process successfully we need to be able to push solids against gravity. To do that, first we need to make sure that fermentation has not started, that the must is not below 55°F/12°C and thoroughly de-pectinized before it hits the flotation unit. Endozym Flotation is a fast acting liquid pectinase enzyme that promotes the hydrolysis of the pectin and the separation of juice from the pomace, resulting in an increase of free-run juice yield and a juice that will be ready to "flot" in a reasonable time, preventing risks of early fermentation starts.

Utilization: Dilute directly in 20-30 parts of non-sulfurized must or in demineralized water and add to must or directly onto the grapes. The activity of Endozym Flotation is reduced by lower temperatures. The product can be added directly into the press, thus allowing for good contact time with the must before its refrigeration. Precaution needs to be taken in order to avoid the contact between the enzyme and high dosage levels of SO₂ or bentonite.

Dosage: 5-10 ml per ton of grapes (5.75-11.5 grams per ton). 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: Endozym Flotation should be stored at 5°C/40°F for a period not longer than 24 months.

Packaging: 10 kg pales

Endozym Ice: extra rapid liquid pectinase enzyme for must settling even at cold temperatures. Endozym Ice is a preparation developed on a solid media, which has been enriched in secondary activities that are able to process the most intricate pectin in the so-called "hairy zones". This ability results in a very fast de-pectinization that also prevents the inhibition of limiting factors like cold, low pH or SO₂.

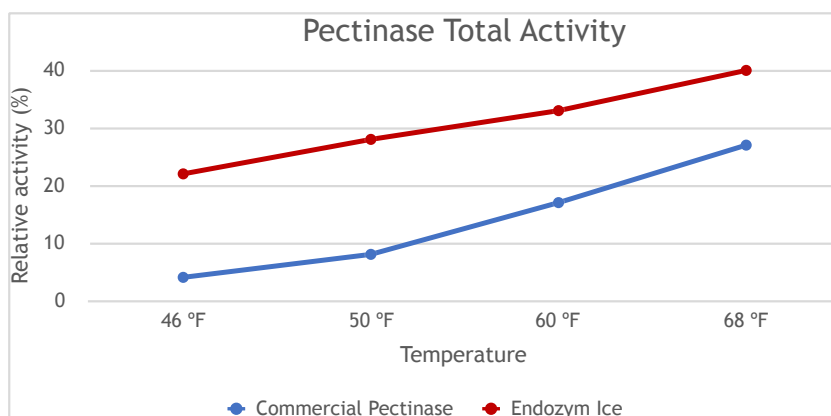
Utilization: Dilute directly in 20-30 parts of non-sulfurized must or in de-mineralized water and add to must or directly onto the grapes.

Dosage: 2-6 ml per ton of grapes (about 2.3-6.9 grams per ton). The dosages vary according to the grapes to be treated or the vinification technology applied. Treatments of musts with a high percentage of pectin and suspended solids require the higher end of the dosage range.

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

Packaging: 1 Kg plastic bottle

	COMMERCIAL PECTINASE	ENDOZYM ICE
46 °F	4	22
50 °F	8	28
60 °F	17	33
68 °F	27	40

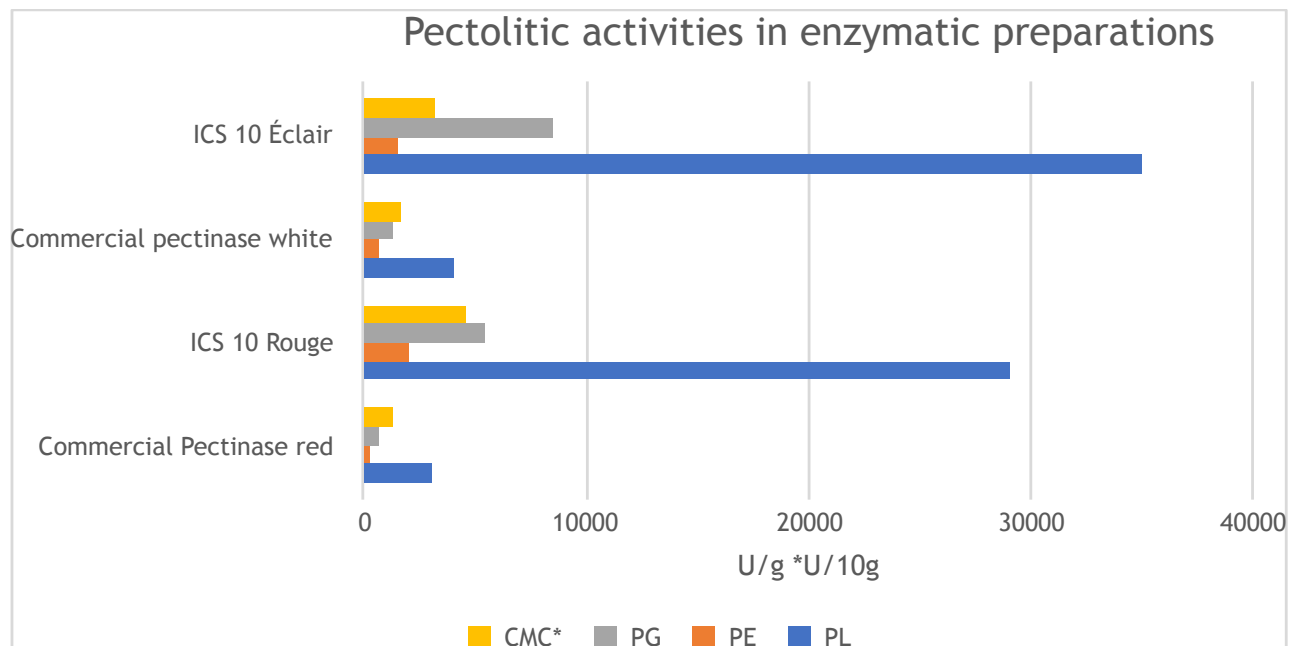


The factors impacting enzyme activity include pH, temperature, and contact time. Decreases in pH, temperature, and/or contact time, along with increases in SO₂ may impact enzyme effectiveness. Graph shows low temperature effect on commercial pectinase vs Endozym ICE.

Endozym ICS 10 Éclair: high concentration liquid pectinase enzyme. It contains 35,000 Pectin-lyase units per gram, making its clarification activity significantly greater than any other enzyme in the market. It has been specifically formulated to break down grape pectin chains, enabling a rapid reduction of must viscosity and fast sedimentation. With the utilization of this preparation, yields in free run juice are increased and more compact sediment is obtained. 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.

Utilization: Dilute directly in 20-30 parts of non-sulfurized must or in demineralized water and add to must or directly onto the grapes. If grapes are too rich in phenolics the product may be added at the press discharge to avoid extraction from skins and

	COMMERCIAL PECTINASE RED	ICS 10 ROUGE	COMMERCIAL PECTINASE WHITE	ICS 10 ÉCLAIR
PL	3000	29000	4000	35000
PE	250	2040	600	1550
PG	600	5433	1300	8500
CMC	1250	4500	1650	3150



Pectinase enzymes attack and degrade the plant cell wall structural polysaccharide, pectin. Commercial pectinase formulations include several linkage-specific components that (collectively) bring about more-complete degradation of grape tissue. Graph shows incidence of pectolytic activities in the enzymatic preparations.

stems. For juice, the dosage should be maintained as the same that would be used for grapes to compensate for shorter contact time or lower temperature.

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

Shelf life and storage: Endozym ICS 10 Éclair should be stored at 5°C/40°F for a period not longer than 24 months.

Packaging: 250 ml & 1kg plastic bottle.



Endozym Micro: liquid pectinase enzyme. Endozym Micro is a concentrated liquid pectinase enzyme, characterized by its high pectinlyase (PL) content of 16,800 PL units per gram. It promotes the hydrolysis of the pectins and the separation of juice from the pomace, resulting in an increase of free-run juice yield. This enzymatic suspension also speeds up clarification, resulting in more compact lees. As a result of a cleaner must, the wine will be more protein stable and easier to filter.

Utilization: Dilute directly in 20-30 parts of non-sulfurized must or in demineralized water and add to must or directly onto the grapes. The product can be added directly into the crushed grape line, thus allowing for good contact time with must before refrigeration. Precaution needs to be taken in order to avoid the contact between the enzyme and high dosage levels of SO₂ or bentonite. Lower temperatures reduce the activity of Endozym Micro.

Dosage: 2-6 ml per ton of grapes (about 2.3-6.9 grams per ton). Dosages vary according to the grapes to be treated or the vinification technology applied. Treatments at low temperatures and on 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: Endozym Micro should be stored at 5°C/40°F for a period not longer than 24 months.

Packaging: 10 & 25 Kg pales

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, and by the so called “hairy spots”. These are ramifications of the polygalacturonic acid molecule (pectin) that are much harder to process than regular ones. Secondary activities such as arabanase and rhamnosidase are key ingredients that allow Endozym Muscat to quickly remove pectin in the most challenging varieties. These secondary activities are all encoded on the DNA of the *Aspergillus niger* producing the enzyme and expressed thanks to the inducers applied during the solid phase fermentation system in our production plant in Paris.

Utilization: Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes. Lower temperatures reduce the activity of Endozym Muscat. The product can be added directly into the receiving line, thus allowing for good contact time with must before refrigeration. Precaution needs to be taken in order to avoid the contact between the enzyme and high dosage levels of SO₂ or bentonite.

Dosage: 20-40 grams per ton of grape depending on contact time, temperature and SO₂ content.

Shelf life and storage: Endozym Muscat 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.

Enzymes for cold maceration of white grapes:

These enzymes are used to weaken the cell walls of the pulp and to hydrolyze the soluble pectins. The enzymatic activities used during the pellicular maceration phase (PG, PL and CMC) release the aromatic substances and bouquet precursors, which normally remain trapped in the pomace. They also facilitate the release of the juice and increase yields, avoiding long cycles and high PSI's in the press. Also, due to the presence of a protective lipid layer on their surface, enzymes do not have any effect on grape seeds.



Endozym Cultivar: granular enzyme for cold maceration of white grapes. Endozym Cultivar is best used at the press or added to the must going to the cold maceration tank. It weakens the cell walls in the pulp facilitating aromas extraction. It also has a very high β -Glucosidase activity to release terpenes from sugars and provides a PL and PG action that is comparable to enzymes used for must settling and yield.

Utilization: Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add directly onto the grapes going to the press.

Cold maceration is normally performed by leaving the crushed grapes at 5-8°C/40-46°F for about 24 hours. These low temperatures reduce the activity of Endozym Cultivar. The enzyme should be added directly on the truck/gondola or into the receiving line, thus allowing for good contact time before refrigeration. Precaution needs to be taken in order to avoid the contact between the enzyme and high levels of SO₂ or bentonite.

Dosage: 20-40 grams per ton of grapes depending on contact time, temperature and SO₂ content.

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

Highlights: The addition of enzymes like Endozym Cultivar during cold maceration facilitates pressing and clarification, yielding musts that are richer in aromatic precursors.

Packaging: 500g vacuum-sealed cans.



Color and macerating enzymes:

Anthocyanidins are the red grape pigments, which mainly occur in the grape skin. In order to dissolve anthocyanins better and improve tannin extraction from the skin, which contribute to color stability, enzymatic preparations with a high hemicellulasic and cellulosic (CMC) enzymatic activities are needed. In fact, if the extraction is uncompleted, the grape skin forms a physical barrier against the diffusion of anthocyanins, tannins and flavors from the cells. The extraction enzymes act on the cells of the berry peel, allowing a very rapid extraction of anthocyanins and tannins and a slow extraction of the tannin-polysaccharide complexes of the cell walls. The addition of these enzymes is carried out either directly on the red grapes at the crusher, or at the beginning of maceration, at the first pump-over. After that, the enzymatic activity is inhibited by the presence of alcohol, and by the extracted tannins that will bind to the enzyme's proteins, denaturing it. AEB enzymes do not extract any component from the grape seeds, which are protected by an external lipid layer. The activity of these enzymes increases with higher dosages, longer contact time and warmer temperatures.



Endozym ICS 10 Rouge: liquid maceration and color extraction enzyme. Endozym ICS 10 Rouge comes in the form of a super concentrated liquid product. It has been basically reduced to the active ingredient and winemakers can dilute it down according to their needs. This makes the enzyme more practical to store and ship, avoiding the risk of being left around under the heat where it would quickly lose its activity. It contains 20,000 Pectinlyase units, making this product's clarification activity significantly greater than average.

The secondary activities (cellulase, polygalacturonase and hemicellulase) that characterize Endozym ICS 10 Rouge, allow it to penetrate the cellular walls, enabling rapid color and phenolic extraction. Wines obtained from grapes treated with Endozym ICS 10 Rouge will be more structured and complex. The pomace treated with this enzyme displays a higher permeability and increases the free-run juice quality and quantity. Its high PL concentration breaks down grape pectin chains, enabling a rapid reduction of must viscosity, faster and more compacted sedimentation.

Utilization: Enzymes are proteins and tend to be inactivated by tannins and alcohol. In a red must environment, their activity will be limited in time. For this reason, we recommend adding the macerating enzymes only in optimal conditions. This would be at the first pump over, right before fermentation starts, and when the temperature is above 60°F-18°C. A pump over is also a perfect way to mix and homogenize the product.

Dosage: 1 to 3 ml per ton of grapes (1.15-3.45 grams/ton). 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: Endozym ICS 10 Rouge should be stored at 5°C/40°F for a period not longer than 24 months.

Packaging: 250 ml & 1kg plastic bottle.



Endozym Rouge deep skin: is an ideal enzyme for processing varieties that have thick skins, which if managed incorrectly, can lead to wines that have a higher concentration of lees, hence presenting additional difficulties during pressing. When using Endozym Rouge Deep Skin, pumping over cycles can be regulated, based on the chosen fermentation protocol, helping to reduce odors, avoiding the risk of color dilution, whilst ultimately optimizing color extraction. The resulting pomace will be easier to press and will help to reduce drainage grid blockages. It helps to produce wines that are more vivid in color, have accentuated shades of blue and overall have greater color intensity. The wines produced can be immediately bottled as fresh and fruity



finished products. It 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/ton or 1000 kg of grapes.

Shelf-life and storage: store at 5°C/40°F for a period not longer than 24 months.

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, which if managed incorrectly (wrong preparation and/or dose causing over extraction) 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/ton or 1000 kg of grapes.

Shelf-life and storage: store at 5°C/40°F for a period not longer than 24 months.

Packaging: 1kg plastic bottle.

Product available only on special order.

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.

Utilization: dilute directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to the tank at first pump-over or add directly onto the grapes on the truck or conveyer. Enzymes are proteins and tend to be inactivated by tannins and alcohol. In a red must environment, their activity will be limited in time. For this reason, we recommend adding the macerating enzymes only in optimal conditions. This would be right when fermentation starts and when the temperature is above

60°F-18°C. A pump over is always a good way to mix and homogenize the product.

Dosage: 20-40 grams per ton of grapes depending pH, temperature and SO₂ content. Low pH, temperature and high sulfur, call for the higher end of the dosage range.

Shelf life and storage: Endozym Contact Pelliculaire 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.

Highlights:

A can per truck is the typical dosage of this enzyme. Easy to do and easy to see if the enzyme has been applied, thanks to the white dispersing agents mixed in the product.

Enzymes for Flash-Détente technology and Thermo

Endozym TMO: liquid pool of enzymatic activities for clarification of heat extracted musts. It's characterized by strong secondary activities, able to intervene on pectic chains present in the skin. Coming out of thermo processing, these molecules heavily interfere with the brightness of the processed must and are usually harder than normal to degrade. Endozym TMO displays an optimal concentration in pectolytic units and is ideal to remove clogging polysaccharides. In fact, this enzyme degrades them, resulting in a marked improvement of must clarity.

Utilization: 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 40°C.

Dosage: from 20-40 ppm.

Shelf life and storage: can be kept for two years in the original sealed packaging and temperature below 10°C.

Packaging: 1 kg bottles and 10 kg pales.

Aromatic and post-fermentative enzymes

The organoleptic properties of wine are determined by a variety of different compounds that are already present in the grape. Some aromatic compounds do not exist in a free form but are conjugated forming water-soluble and odorless complexes. Enzymatic hydrolysis releases many aromatic volatile terpenes (aglycones) and volatile thiols. Glycosidase activities have been detected in various *S. cerevisiae* (Fermol Arome Plus or Fermol Sauvignon) and non-Saccharomyces yeasts (Primaflora, *Levulia Torula*).

Another compound present in wine, glucan, is used by several strains of lactic acid bacteria and the grape fungus *Botrytis cinerea* to produce viscous capsular or extracellular polysaccharides impairing wine filtration. The colloidal polysaccharides cannot be removed from wine by flocculants, adsorbents or filtration. Thus, AEB enzymes with glucanase activities are useful to reduce viscosity of musts and wines caused by microbial contamination.

Endozym Antibotrytis: eliminates laccase and prevents plugging. Endozym Antibotrytis is a purified enzymatic preparation, with activities useful to solve problems deriving from the presence of *Botrytis Cinerea* in the must. Endozym Antibotrytis indirectly acts towards polyphenol oxidases (tyrosinase-laccase) present in the must, inactivating them and enabling aromatic precursors to be preserved together with the coloring matter. To guarantee pectin hydrolyzation and color extraction, Endozym Antibotrytis should be used in association with normal clarification or color extraction enzymes. The treatment with Endozym Antibotrytis is decisive in musts obtained by grapes heavily attacked by grey mold, responsible for problems which cannot be solved either by sulfur dioxide or by other technological solutions.

Utilization: Dilute directly in 20-30 parts of non-sulfurized must or in de-mineralized water and add to must or wine.



Dosage: 30-50 grams per ton of grapes or 20-40 grams per hl of wine (1.5-3 lbs./1,000 gallons). 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

Endozym β -Split: granulated beta-glucosidase specific for aroma extraction. To be added to the fermentation of red rosé and white musts either mid-way through the fermentation or to the finished wines before bentonite addition. It is a beta-glucosidase for aroma enhancement, which has been developed in a solid phase media and therefore expresses a multitude of induced secondary activities. Thanks to these, β -Split can cleave aromatics not only from the beta-glucosides, but also from the pentoses non fermentable sugars.

Utilization: dissolve directly in 20-30 parts of non-sulfurized must or in demineralized water and add to wine.

Dosage: 2-5 grams per hL depending on contact time, temperature and SO₂ content. The activity of Endozym β -Split is reduced by high sugar and low temperatures, so dosage must be increased accordingly.

Even if its usage is more effective toward the end of fermentation, this enzyme is often used successfully in finished wines to ameliorate aroma expression. Precaution needs

to be taken in order to avoid the contact between the enzyme and high dosage levels of SO₂ or bentonite. In white and rosé wines, Bentogran should be utilized to neutralize the enzyme when the desired aromatic profile is achieved.

Shelf life and Storage: Endozym β -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 Glucapec: enzyme to facilitate filterability in wines rich in glucans, like the ones obtained from Botrytis infected grapes. Endozym Glucapec is a β -Glucanase enzyme formulated for the treatment of wines that are rich in glucans and pectins derived both from botrytis-infected grapes and from yeast cell walls. Botrytis cinerea affected grapes in fact are rich in glucans, a polysaccharide that is considered the principal responsible for the increase in viscosity of musts and wines. The use of β -glucanase preparations obtained from Trichoderma harzianum makes it possible to considerably improve the filterability of wines: glucanase enzymes break down the glucan molecule, improving both filterability and the efficiency of wine fining practices. The β -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 tartaric stability of wines. Ideally this enzyme should be utilized between 60 and 78°F (16-24 °C) and is never to be used in conjunction with bentonite.

Endozym Glucapec activities:

- PL Pectinlyase: for the degradation of both esterified and non-esterified pectins. It is a crucial activity for all AEB enzymes and allows faster clarifications.
- PG Polygalacturonase: for the degradation of non-esterified pectins. Its activity combined with the PE activity helps achieving clear juices.
- PE Pectinesterase: teams up with the PG to fragment pectins.
- BGU Glucanase: breaks up the b-1,3 and b-1,6 links of glucans.
- Arabanase: breaks up polysaccharides made of arabinol, which may cause haze and difficulties in filtration.

Utilization: Dilute in 20-30 parts wine with low SO₂ or de-mineralized water. Add directly 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.

Dosage: 2 to 4 g/hl or 20-40 ppm or 1/3 lb./1,000 gallons (higher temperatures allow the lower dosages).

Shelf life: Stable at room temperature (less than 75°F) for 3 years.

Packaging: 500g cans.



Endozym Thiol: liquid carbon-sulfur lyase to favor the hydrolysis of the thiols precursors and enhance their expression in the wine. Thiols are an important component of the bouquet of Sauvignon Blanc, Riesling and Gewürztraminer; however, they come anchored to a Cysteine group, which makes them non-volatile. Endozym thiol promotes the conversion of Cys-4-MMP and Cys-3-MH into 4MMP (4-Mercapto-4-methyl-pentan-2-one) reminiscent of gooseberry and MH (3-mercaptohexan-1-ol), reminiscent of grapefruit.

Utilization: Add to the fermenting tank midway through fermentation. Use Elevage Glu for protecting oxidation of the aromatic if this risk occurs.

Dosage: 20-40 ml (23-46 g) per ton of grape, or 20-40 ppm on must to be treated depending on time, temperature and SO₂ content.

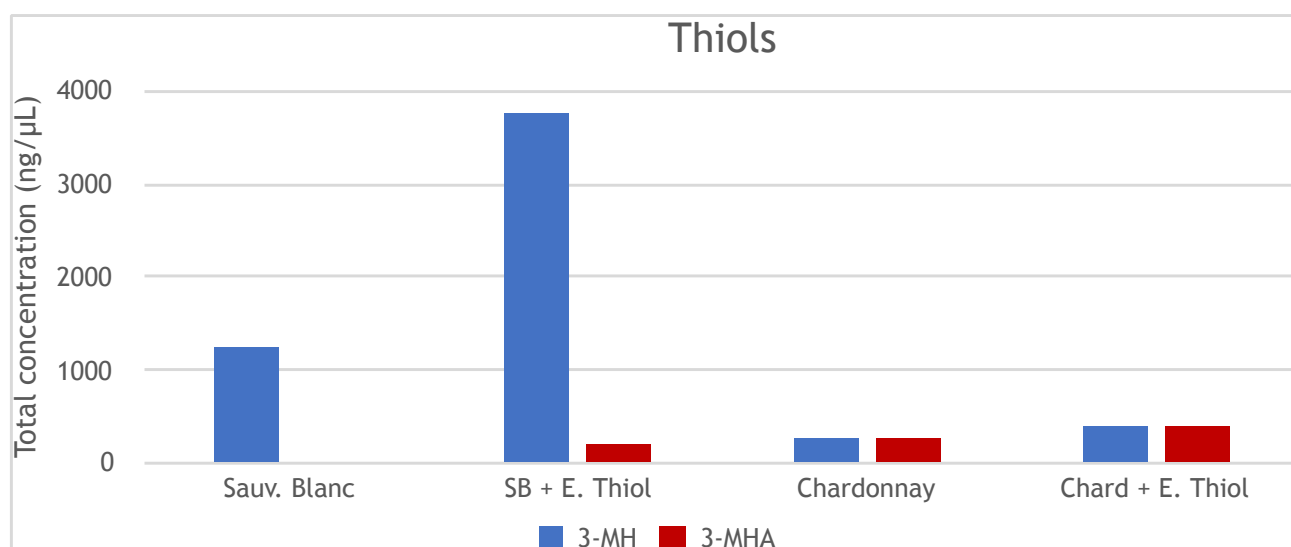
Shelf life and storage: Endozym Thiol should be stored at 5°C/40°F for a period not longer than 24 months.

Packaging: 1 liter bottles

Highlights:

Timing the addition of Endozym thiol, different aroma profiles can be achieved. In addition of achieving more 4MMP, early additions enables yeast to convert 3-MH (grapefruit) into 3-MHA (passion fruit).

	SAUV. BLANC	SB + E. THIOL	CHARDONNAY	CHARD + E. THIOL
3-MH	1250	3750	270	390
3-MHA	30	200	270	375



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. 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.

Enzymes for the clarification of apple juices for cider making.

Endozym Alphamyl FJ: α -amylase enzyme for the clarification of cider and perry. It's used on milled apples/pears, or juice, in order to degrade the starch. The α -amylases can hydrolyze intact starch granules with the formation of soluble products. They are responsible for the initial degradation of starch granules during malting. α -Amylases, acting on their own, can degrade amylose to a mixture of shorter linear α -glucan chains (linear α -dextrins), oligosaccharides, maltose, and glucose. Endozym Alphamyl FJ facilitates the clarification process before fermentation. It avoids possible starch related haze and facilitates ultra-filtration.

Utilization: Dilute the product 5:10 times in deionized water and mix well into the media. Contact time varies from 1 hour at 45 Celsius (113 Fahrenheit) to 6 hours at 10 Celsius (50 Fahrenheit). Fungal α -amylase is active up to 60°-65°C(140°-149°F) and has optimal activity in the range of 52°-62°C (125°-144°F). The enzyme is completely deactivated above 70°C (158°F).

Dosage: will vary according to the temperature of the apples/pears and the maturity (early season fruit has normally more starch, so it requires more enzyme). Use 2-6 ml/100Kg of apples at 45-50°C. Contact time 60 minutes. If heat isn't available, use 20ml/100Kg and increase contact time.

Shelf life and storage: can be kept for two years in the original sealed packaging away from light, and in a cool, dry, odor-free place at a temperature below 10°C. Do not freeze.



Packaging: 1 Kg bottles and 25 Kg pales

Endozym Pectofruit PR: cellulase for increasing yield and to help clarification of cider and perry. Endozym Pectofruit PR is an ultra-concentrated enzymatic preparation, specifically prepared 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. Also, secondary activities like arabanase, cellulase and hemicellulase, work specifically for increasing yield and to help clarification. Advantages: better fruit extraction and viscosity improvement, yield increase during pressing, effective action on scraping or mash even with a limited contact time. Fruits where Endozym Pectofruit PR can be used with effectiveness other than apples include: red fruits, such as currant, raspberries and blackberries, summer fruits such as peach, plum and apricot.

Utilization: Dilute the product 5:10 times in deionized water and mix well into the media. Dilute the product 5:10 times in deionized water and mix well into the media. Contact time varies from 30 minutes at 45 Celsius (113 Fahrenheit) to 2-3 hours at 10 Celsius (50 Fahrenheit). It is normally used before pressing.


Dosage: Use 30 ml/100Kg of apples at 45-50 Celsius, if heat isn't available use 70 ml/100Kg

Shelf life and storage: can be kept for two years in the original sealed packaging away from light, and in a cool, dry, odor-free place at a temperature below 10°C. Do not freeze.

Packaging: 1 Kg bottles and 25 Kg pale.

CHAPTER FIVE

Tannins

TANNIN	PRODUCT	CHARACTERISTICS
 NEW VARIETAL FERMENTATION TANNINS	FERMOTAN CB	PROANTHOCYANIDINIC TANNINS (GRAPE SKIN AND SEED) AND QUEBRACHO SPECIFIC FOR CABERNET, MERLOT, TOROLDEGO, MONTEPULCIANO, BARBERA.
	FERMOTAN AG	WOOD AND SKIN HYDROLIZABLE TANNINS AND ELLAGIC TANNINS FOR AGLIANICO, NERO D'AVOLA, PRIMITIVO, ZINFANDEL, MALBEC, TEMPRANILLO, SYRAH.
	FERMOTAN SG	MIX OF ELLAGIC AND WOOD PROANTHOCYANIDIN TANNINS FOR PINOT NOIR AND SANGIOVESE
FERMENTATION TANNINS	FERMOTAN	FERMENTATION TANNIN WITH 60% PROANTHOCYANIDINS AND 40% ELLAGIC TANNINS. FOR COLOR STABILIZATION & STRUCTURE
	FERMOTAN BLANC	ELLAGIC TANNIN FOR STRUCTURE AND OXYGEN PROTECTION
	FERMOTAN LIQUID	LIQUID VERSION OF FERMOTAN
	GALLOVIN	TANNIN FROM GALLNUTS TO PROTECT FROM OXYGEN AND TO NEUTRALIZE LACCASE FROM BOTRYTIS
	GALLOVIN LIQUID	LIQUID VERSION OF GALLOVIN
	TANETHYL EFFE	TANETHYL PRODUCT BLENDED WITH ELLAGIC TANNINS
FINISHING TANNINS	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
	ELLAGITAN BARRIQUE LIQUID	LIQUID OAK TANNIN WITH NUANCES OF VANILLA, WHISKY LACTONE AND COCONUT
	ELLAGITAN BARRIQUE ROUGE	POWDERY OAK TANNIN WITH NUANCES OF VANILLA, WHISKY LACTONE AND COCONUT
	EB XO	LIQUID OAK TANNIN WITH NUANCES OF SYRINGALDHEYDE (SMOKY), SPICES AND VANILLA.

TANNIN	PRODUCT	CHARACTERISTICS
MATURATION TANNINS	ELLAGITAN CHENE	POWDERY OAK TANNIN TO ELEVATE FRUIT EXPRESSION
	ELLAGITAN EXTREME	POWDERY OAK TANNIN TO ELEVATE FRUIT AND SPICES EXPRESSION
	ELLAGITAN REFILL	UN-TOASTED OAK TANNIN TO RE-ESTABLISH THE REDOX POTENTIAL
	PROTAN BIOPEEL	ORGANIC LIQUID GRAPE-SKIN-DERIVED TANNIN
	PROTAN BOIS	QUEBRACHO DERIVED TANNIN FOR AGING STRUCTURE AND COLOR STABILIZATION
	PROTAN MALBEC	NUTTY AND STRUCTURED GRAPE-SEED DERIVED TANNIN
	PROTAN PEEL	LIQUID GRAPE-SKIN DERIVED TANNIN
	PROTAN PEPIN OXILINK	OLD-WORLD STYLE GRAPE-SEED DERIVED TANNIN
	PROTAN RAISIN	"VELVETY" AND STRUCTURED GRAPE-SKIN DERIVED TANNIN
	TANETHYL	FAST POLYMERIZING, GRAPE-SEED-DERIVED TANNIN
	TANIBLANC	STRONG ANTIOXIDANT, HIGHLY REACTIVE, ELLAGIC TANNIN
	TANQUERC	CHOCOLATE-MOCHA STYLE, GRANULATED OAK TANNIN. IDEAL FOR MOX PROCESSING

Commercial tannins are polyphenolic compounds extracted from grapes, Quebracho, Oak, Chestnut, Tara and Galla, which can be divided into condensed tannins, also called proanthocyanidins, and hydrolysable tannins, including gallic and ellagic tannins.

The two groups have very different characteristics and AEB developed a wide range of products to offer the wine industry multiple targeted solutions to:

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

Fermentation Tannins:

It is pretty much agreed in the winemaking community that the addition of tannins to the fermentation brings advantages to color stability and helps to have lower VA and overall a cleaner fermentation without the usage of SO₂. Some of these added tannins will be lost, leaving the natural tannins in solution and in fact, these so called “sacrificial tannins”, will precipitate with proteins in the first stages of fermentation. These are proanthocyanidins derived from grapes or Quebracho, a wood rich in condensed tannins of natural high molecular weight. The balance of the proanthocyanidins left in solution will be the substrate for color stability and the backbone of the finished wine.

Fermotan and Fermotan liquid: it’s a highly reactive tannin developed for quick reaction both with proteins and with colored pigments. It contains 40% ellagic and 60% proanthocyanidinic tannins, and, when added during fermentation, it rapidly acts as “sacrificial tannin”, stabilizing red wine color and optimizing the level of noble tannins. Fermotan works best in presence of alcohol, during the first phase of fermentation, when color is released and needs to be stabilized. This normally happens in the first five days of maceration. Later additions of Fermotan will also benefit color stability and structure. This product is available both in liquid and powdered form.

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

Dosage (Powder): 12-48 g/hL (1-4 lb./1000 gal) in red must.

Dosage (Liquid): consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages in red must range 120-960 ppm or 10-80 ml/hL (3.80 L/1,000 gallons or 1-8 lb./1000 gal).

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

Packaging (Liquid): 5 kg bottles, 25 kg drum (about 4.16-20.8 liters).

Fermotan Blanc: it adds “oaky” structure to white musts and protects wines from oxygen and free radicals. It contains ellagic tannins from oak that have the capability to build a

smooth structure and gallic tannins to protect the wine from oxygen. It produces wines with better structure, reduces roughness and preserves the aromatic freshness for a longer period. Fermotan Blanc acts in synergy with sulfur dioxide, retaining a higher percentage of free SO₂, both at the beginning and at the end of fermentation. In this way SO₂ additions can be significantly reduced.

Utilization: Dissolve 1:10 in must or warm water (35°C/95°F) and add as early as possible to the grapes. The best application is to add it directly in the bins or gondola, or at the grape conveyer.

Dosage: 5 to 40g/hL (1/2-3 lbs./1000 gal) in white musts.

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 packets



Tanéthyl Effe: tannin for color stabilization in cold soak and for rosé wines. It's a blend of ellagic tannins from oak and proanthocyanidinic tannins from grapes. The condensed tannin fraction is extracted from grape seeds by means of a patented system, which locks an active

ethanal bridge into the tannin. Ethanal bridges have been shown to be greatly responsible for color stabilization and tannin polymerization. The utilization of Tanéthyl Effe is highly recommended for stabilizing color during cold soak of red wines (and the first stage of fermentation). It 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.

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

Dosage: rosé wines: 4 to 12 g/hL (1/3–1 lb./1000 Gal).

Red wines: 12 to 36 g/hL (–3 lb./1000 Gal).

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.

Highlights: because of the already active ethanal bridge, Tanéthyl Effe is the best tannin to stabilize color during cold soak when ethanol is completely absent.

Packaging: 1 kg packets

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 tinturier 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) medium stability and acylated forms, which is the most stable. 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, and then carried out a study on 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, resulting in a significant stronger color intensity and more lively color hues.

Based on genetic maps that cluster varieties with similar anthocyanins profiles, AEB has formulated different tannins blends to target color stability for varieties with similar characteristics.

Fermotan CB: is a mix of proanthocyanidinic tannins obtained from grape skins, grape seed 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 recommended to use 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 brings the correct amount of reactive proanthocyanidins to stabilize the color from the early vinification stages. Its utilization is suggested 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, with a soft taste. It helps preserving and stably evolving the color from the early vinification stages. Its utilization is suggested from the first vinification stages for Sangiovese and Pinot Noir.

Dosage: From 5 to 40 g/hL (0.5 – 3 lbs./1000 gal).

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.

Hydrolysable tannins

(ellagic tannins from oak or gallic tannins from gallnuts)



Ellagitan Extreme: is an ellagic tannin extracted from toasted American oak staves. It is sweet 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 in general.

Both in red and white wines it adds a round and complex structure that is never bitter or astringent, even at high dosages. 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.

Utilization: rehydrate in warm water (35°C/95°F) or wine, for 1\2 h before mixing. Then make a 1:10 slurry and add directly to circulating tank or barrel. Wait at least a week before filtering.

Dosage: 12-50 g/hL (1-4 lbs./1000 gal)

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: 500g packets

Ellagitan Refill: un-toasted oak derived ellagic tannin that, along with oxygen, promotes ethanal production for phenolics polymerization. This is a crucial step in aging red wines and in building a smoother structure. In fact, un-toasted ellagic tannins catalyze the aging process, where tannins from seeds and skins lose roughness and become more elegant and “chewy”. At the same time, color is stabilized. Ellagitan Refill is an ellagic tannin in an aqueous solution, originally studied by AEB to reintegrate 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. The same tannin may be used to increase structure or in tanks to optimize micro-oxygenation. Its hydrolysable nature also helps to cure the presence of reductive odors.

Directions for use: Dilute in ten parts of wine and add to mass by pumping over or mixer. Allow at least a week before filtering.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs./1000 gal).

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 and 25 kg pales.

Taniblanc: enhances fruit expression and oxidation resistance in white and rosé wines. It's a soft ellagic tannin derived from prized oak, and highly purified for use in musts, red, white and rosé wines. Its antioxidant activity protects the wines during the entire period of bottle maturation and reduces the needs of chemical preservatives like sulfur and ascorbate. The use of Taniblanc, 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 proanthocyanidinic tannins. It is also recommended to lower reduction problems.

Directions for use: Re-hydrate in warm water (35°C/95°F) or wine, for 1/2 h before mixing. Then make a slurry 1:10 in wine and add directly to circulating tank or barrel.

Dosage: red wines: 12-50 g/hL (1-4 lbs./1000 gal); rosé wines 12–25 g/hL (1-2 lbs./1000 gal); white wines 6-12 g/hL (1/2–1 lb./1000 gal).

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 packets.

Taniquerc: derived from toasted French oak, is an ellagic tannin that promotes tannins polymerization during micro-oxygenation and that highlights the structure of red wines in general. It is also very efficient in removing reduction. The tannic infusion has been extracted by means of prolonged maceration in cold water. This technique promotes the precipitation of the bitter substances present in toasted woods. If used with micro-oxygenation, Taniquerc promotes the 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. Utilization: rehydrate in warm water (35°C/95°F) or wine, for 1/2 h before mixing. Then make a slurry 1:10 in wine and add it directly to circulating tank or barrel

Dosage: 12-50 g/hL (1-4 lbs./1000 gal).

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 packets and 5 kg bags



Gallovin and Gallovin Liquid: a gallic tannin which could be used as a structuring additive but is mostly geared for protecting from all risks of oxidation, including botrytis infection. Gallovin is also very reactive with proteins. This favors protein stability in white and rosé wines. In reds

it becomes a sacrificial tannin and minimizes the loss of phenolic compounds from the grapes; preserving the noble tannins that would normally precipitate with proteins. The main innovation that AEB brought with this product is the pure and neutral nature of the gallic tannin. Only the core of the gallnuts is used as raw material, making Gallovin a colorless and odorless product that will not affect wine flavors, but will reduce the needs for antioxidants such as SO₂ and ascorbic acid.

Utilization: Dilute in ten parts of wine and add directly on top of the grapes, must or to the wine by pumping over or mixer.

Dosages for powder: on rotten grapes about 150-200 grams per ton (or 1 pound every 2-3 tons of grapes). During oxygen exposure of wine and musts (racking, blending, bottling) about 50 ppm.

For the Gallovin Liquid, consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range in musts is 120-360 ppm or 10-30 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs./1000 gal). Add about 200 ml per ton of grapes.

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 powder: 500 g and 5 kg bags

Packaging liquid: 25 kg pales

The Ellagitan Barrique Line:

American and French Oak derived tannins, in liquid and powdery forms, for fermentation, aging and fine tuning.

- The different Ellagitan Barrique liquid products vary their aromatic profile depending both on the source of wood but also on the toasting levels. Air seasoning initiates the polymer's breakdown into simple sugars in the raw material. As oak climbs through 300°F during toasting, more simple sugars are formed. Caramelized sugars and sweet-associated aromas then develop. Toasty characters develop as the oak temperature exceeds 420°F.

- Structural differences in American oak's hemicellulose and lignin result in more intense wood sugars, and "toastiness".
 - More toasting in general decreases the Whiskey/Lactone compounds making the profile richer in toffee and toasted-wood aromas.
 - In general, when using oak extracts, oak derivatives or barrels, French products contribute with more vanilla and more structure, resulting in a balanced extraction. American oak products contribute with more volatile phenols, like eugenol and guaiacol (spices/smoky) or aldehydes like furfural (almonds). Because these aromatic profiles are usually not supported by a good structuring tannin extraction, all Ellagitan Barrique line tannins are adjusted for a balanced structural content.



Ellagitan Barrique Liquid: the most "French" of the five; with the most vanilla. 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.

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.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. According to our experience this tannin can be used on red wines up to 8.5 lbs./1,000 gallons (about 1,000 ppm). Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs/1000 gal). Minimum dosage for light nuances in reds is 120 ppm

(1lb/1,000 gallons). Higher dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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. A sediment will accumulate in the bottle, that's normal and it could be partially dissolved in wine or hot water.



EB Berry Mix: released in 2019, this ellagic tannin is coming from a new technology of production that retains more of the original oak flavors. It 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 brings along a pleasant bouquet of spices and toasted oak.

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.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280



ml/1,000 gallons or 1-6 lbs/1000 gal). Minimum dosage for light nuances in reds is 120 ppm (1lb/1,000 gallons). Higher dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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. A sediment will accumulate in the bottle, that's normal and it could be partially dissolved in wine or hot water.



EB Fruit Reserve: it 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.

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.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs/1000 gal). Minimum dosage for light nuances in reds is 120 ppm (1lb/1,000 gallons). Higher dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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. A sediment will accumulate in the bottle, that’s normal and it could be partially dissolved in wine or hot water.



EB Goud-Ron: released in 2019, this ellagic tannin is coming from a new technology of production that retains more of the original oak flavors. It helps stabilizing the color, but also introduces a soft note that brings along structure and smoothness. In the nose, it shows notes of “goud-ron” (tar), a typical descriptor of old world wines, reminiscent of the ones found in the great reds from Rhône and Piedmont.

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.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs/1000 gal). Minimum dosage for light nuances in reds is 120 ppm (1lb/1,000 gallons). Higher



dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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. A sediment will accumulate in the bottle, that's normal and it could be partially dissolved in wine or hot water.



EB XO: the most noticeable in the nose among the five liquid Ellagitan Barrique products. It 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 hiding 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.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083 lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. Average dosages range 120-720 ppm or 10-60 ml/hL (380-2,280 ml/1,000 gallons or 1-6 lbs./1000 gal). Minimum dosage for light nuances in reds is 120 ppm (1lb/1,000 gallons). Higher dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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. A sediment will accumulate in the bottle, that's normal and it could be partially dissolved in wine or hot water.



Ellagitan Barrique Rouge: this granulated tannin is extracted from highly toasted oak wood. The seasoning process exceeds two years and is identical to the technique used when producing the most prized barrels. The innovative physical system used for extracting this ellagic tannins, hydrolyzes and then precipitates the other bitter substances. Added polysaccharidic micro-molecules encapsulate the aromatic properties of toasted oak, preventing their dissipation during spray drying. Ellagitan Barrique Rouge prolongs the aromatic persistency, improves the mellowness of wines and integrates their aromatic complexity with delicate nuances reminiscent of chocolate and vanilla. Ellagitan Barrique Rouge 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 reducing the need for SO₂. Furthermore, there is no color or wine loss due to wood absorption.

Directions for use: Re-hydrate in warm water (35°C/95°F) or wine, for at least ½ h before mixing. Then make a slurry 1:10 in wine and add directly to circulating tank or barrel. Allow at least a week before filtering.

Dosage: Minimum dosage for light nuances in reds is 100 ppm (0.8 lb./1,000 gallons). Higher dosage will increase the impact. In whites it may be dosed at 30-120 ppm (1/4-1 lb./1,000 gallons).

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: 500 grams and 10 kg bags

Ellagitan Barrique Blanc: colorless version of the powdery oak tannin described above. Extracted from French oak staves. Will have minor effects on the color. Ellagitan Barrique Blanc is used to highlight the varietal aromas of white and rosé wines. It is also used successfully on Craft Ciders. It has a soft velvety taste and carries antioxidant properties, which preserve varietal aromas, and develop bouquet complexity by regulating the redox potential during the fermentation and post-fermentation stages. It inhibits bacteria or mold contamination reducing the need for SO₂. 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. Wines treated with Ellagitan Barrique Blanc are intense and complex to the nose, due to

the synergy of the tannin with primary fermentation aromas. Wines will result fresher and lively to the palate, free of unpleasant bitterness and rich in body, like after oak barrel-aging.

Directions for use: re-hydrate in warm water (35°C/95°F) or wine, for at least ½ h before mixing. Then make a slurry 1:10 in wine and add it directly to circulating tank or barrel. Allow at least a week before filtering.

Dosage in white wines: 6- 50 g/hL – 1/2-4 lbs./1000 gal.

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: 500 grams packets

Condensed tannins (grape or Quebracho derived):

Protan Bois: proanthocyanidinic tannin extracted from Quebracho wood. Mostly utilized in red wines that need a stronger “structure-boost” on a budget. The nature of this flavanol is very different from the ones from grapes, and it needs a little more time to integrate (about 30-60 days depending on dosage). It strengthens and amplifies the tannin structure, stabilizes the color and reverses the oxidation process adsorbing aldehydes and port-like odors. In our trials it has shown its best effect on color stability, when added in the final part of the fermentation.

Utilization: mix 1:10 in warm water (35°C/95°F) or wine and add directly to circulating tank or barrel.

Dosage: 5-50 g/hL (1/2 -4 lbs. per 1000 gallons). Because of the powerful structure of this tannin it is recommended to allow 15 days of integration before judging the results. After the addition, wait at least one week before filtering the wine.

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: 1kg and 5kg packets

Protan Malbec: throughout history, the wines from Bordeaux have enjoyed the soft and important structure brought by the proanthocyanidins derived from Malbec grapes. It was only after the frost of 1956 that many French vintners abandoned Malbec as a favorite blending component. AEB is now able to provide wineries with the same component that has been the base of the Bordeaux blends for many years. Protan Malbec is a powdered proanthocyanidinic tannin extracted from Malbec seeds, that brings to 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 is also recommended to fix “flat” and “doughnut” white and rosé wines.

Utilization: mix 1:10 in warm water (35°C/95°F) or wine and add directly to circulating tank or barrel. After the addition, wait at least one week before filtering the wine.

Dosage: Whites: 3 to 12 g/hL (1/4-1 lb./1000Gallons). **Reds:** 12-40 g/hL (1-3 lbs./1000 gallons in reds).

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: 500 grams packets



Protan Peel: tannin obtained from unfermented and pressed grape skins, elaborated by a special extraction system for proanthocyanidins that does not alter them and keeps them reactive. This reactivity results in high astringency in the moment when the addition is performed, but also in a quick softening during the first 3-4 weeks of maturation. In a trial performed on a Pinot Noir, an addition at bottling of 2.5 lbs./1,000 of different tannins was compared to oak tannins. Protan Peel addition resulted in a longer shelf life of the wine. It kept expressing fresh fruit for a longer time compared to the untreated control and to wines treated with toasted-oak-extracts. Other experiments, have showed the good results that this tannin brings in terms of reactivity with color and the consequent color stability. For the most common scenarios like for Malbec, Zinfandel, Cabernet, Merlot and even for delicate varieties like Nebbiolo and Sangiovese and Pinot Noir, Protan Peel seemed to have an improving effect on color stability, more so

when added in the first 6 hours of fermentation. For varieties where Malvidin is very prevalent, like in Syrah and Touriga Nacional, the timing that gave the best results was the addition of Protan Peel after 72 hours of fermentation.

Utilization: Mix in warm water (35 °C/95 °F) or wine and add directly to circulating tank or barrel.

Dosage: consider this conversion factor to do additions: 10 ppm = 1g/hl = 0.083

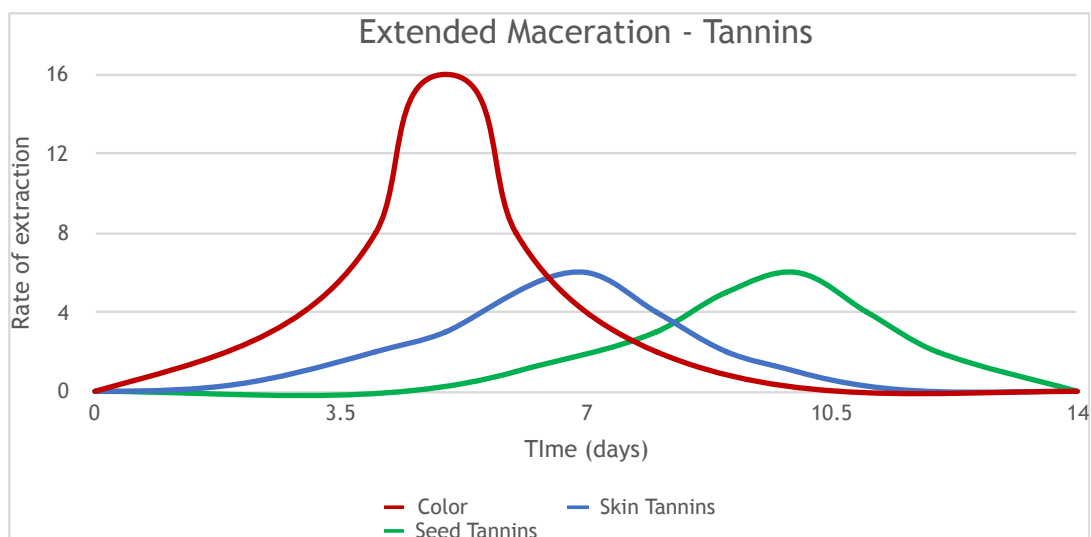
lb./1,000 gallons = 0.85 ml/hl or 32 ml/1,000 gallons. For whites 30 ppm are a good starting point for light varieties like Sauvignon Blanc, Chenin or even French Colombard. In Reds start with 10-50 g/hL (1-5 lbs./1000 gallons). The higher dosages are recommended in fermentation.

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

Packaging: 1 kg bottle and 10 kg pales

Highlights: skin tannins mimic extended maceration effects to create richer, more supple wines with greater aging ability and less bitter tannin.

	COLOR	SKIN TANNINS	SEED TANNINS
0	0	0	0
1	1	0	0
2	2	0	0
3	4	1	0
4	8	2	0
5	16	3	0
6	8	5	1
7	4	6	2
8	2	4	3
9	1	2	5
10	0	1	6
11	0	0	4
12	0	0	2
14	0	0	0



Phenolics extracted over time during maceration on red skins.

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, that ultimately leads to softer tannins and color stability.

Utilization: Mix in warm water (35 °C/95 °F) or wine and add directly to circulating tank or barrel.

Dosage: whites: 3 to 12 g/hL (1/4-1 lb./1000 gallons). **Reds:** 10-50 g/hL (1-5 lbs./1000 gallons).

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: 500gram packets



Protan Raisin: granulated grape skin tannin from Burgundy. It brings its best when used to integrate the oak and the fruit of the wine, building a soft structure around it. In white wines, a small addition goes a long way in protecting from oxygen, building volume and to enhance crispness. Proanthocyanidinic tannins from grape skins add a velvety smooth structure and reverse the oxidation process, absorbing aldehydes and port-like odors. Protan Raisin is a pure proanthocyanin tannin extracted from grape skins. Like all proanthocyanin tannins, skin tannins are naturally present in grapes. 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. The presence of Protan Raisin stimulates polymerization making a wine mellow and harmonious. On the most prestigious Pinot Noirs and all organic wines, it can be used in fermentation to stabilize color and to protect from oxygen. This way minimizing the usage of other antioxidant chemicals.

Utilization: Mix in warm water (35 °C/95 °F) or wine and add directly to circulating tank or barrel. When adding Protan Raisin in a bench trial, wait for at least 3 days

to evaluate. The strong flavor deriving from the dry tannin gives a note that is not completely pleasant until the tannin is fully integrated into the wine. Also, give the tannin a week to integrate before filtering the wine.

Dosage: whites: 3 to 12 g/hL (1/4-1 lb./1000Gallons). **Reds:** 10-50 g/hL (1-5 lbs./1000 gallons).

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: 500gram packets



Tanéthyl: tannin extracted from grape seeds by means of a patented system, which locks an active ethanal bridge to the tannin. Ethanal bridges have been shown to be greatly responsible for color stabilization and tannin polymerization. Tanéthyl is a great tool for achieving the big, soft structure provided by micro oxygenation, without using oxygen. It can be used both in reds and whites to increase volume and to balance a rough polyphenolic profile. In wines with high pH's where micro-oxygenation is not recommended, Tanéthyl can continue the polymerization process of polyphenols even in a reductive environment.

Utilization: Mix in a separate tub with warm water (35 °C/95 °F) and then add to the grapes or to the fermenting must during pump over. If used in a finished wine, after addition, wait at least one week before filtering the wine.

Dosage: rosé wines: 5 to 15 g/hL (1/3 – 1 lb./1000 Gal), **red wines:** 12 to 36 g/hL (1–3 lbs./1000 Gal).

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: 500 g packets

Highlights: because of its ability to form the activated ethanal bridge without oxygen, Tanéthyl is the best tannin to stabilize color during aging, when MOX is not a suitable alternative.

CHAPTER SIX

Polysaccharides

PRODUCT	CHARACTERISTICS
ARABINOL AROME	LIQUID GUM ARABIC BASED PRODUCT TO STABILIZE AROMAS AND SOFTEN THE MID-PALATE
ARABINOL	LIQUID GUM ARABIC. IT SMOOTHS OUT THE MID-PALATE, HELPS WITH TARTRATE STABILITY AND PRESERVES FREE SO ₂
ARABINOL HC	
NEW! ARABINOL SUPER ROUGE	LIQUID GUM ARABIC WITH HIGH ARABINOSE AND RHAMNOSE CONTENT, RESULTING IN INCREASED SWEET PERCEPTION. ITS COMPOSITION ALSO STABILIZES THE RED PIGMENTS
BATONNAGE PLUS ELEVAGE	YEAST DERIVED MANNOPROTEIN, TO ADD ROUNDNESS AND TO PROTECT FROM OXIDATION
BATONNAGE PLUS TEXTURE	
BATONNAGE PLUS STRUCTURE	YEAST DERIVED MANNOPROTEINS WITH ELLAGIC TANNINS TO ADD ROUNDNESS AND STRUCTURE
ELEVAGE GLU	HIGH GLUTATHIONE, YEAST-DERIVED PEPTIDE. PROVIDES VOLUME & PROTECTION FROM OXYGEN
SUPER-MANN	PURE MANNOPROTEIN FOR TARTARIC STABILIZATION AND WINE SMOOTHENING

Polysaccharides are the main macromolecules of colloidal nature in wines and play a fundamental role in the technological properties and organoleptic characteristics of the wines. Wine polysaccharides are widely known for their effect on the physicochemical stabilization of wine; thus, they can interact with the colloidal particles present in wines, reducing their reactivity and limiting their aggregation and flocculation. These macromolecules could interact and aggregate with tannins, prevent the formation of protein haze in white wines, and delay or even arrest the outgrowth of the crystals of potassium bitartrate. Wine polysaccharides have also been associated to the mouthfeel perceptions because they are able to modify the sensory properties of wines, modulating the astringency perception, increasing the sweetness sensation and body.

When & why

- In red wines fermentation, aging and cold stabilization
- Between primary and malolactic fermentation or to extend shelf-life in general
- Before bottling, to improve mouthfeel
- To improve cold stability

Gum Arabic

Gum Arabic is a natural gummy exudation from the branches of the Acacia Seyal tree. One tree will yield about 200 grams to 2 kg of gum (about 0.5-4 pounds) per year. Even though the structure of Gum Arabic is not completely known, it is basically composed of a high molecular weight polysaccharide that contains residues of neutral sugars and acids. This mixture of polysaccharides and glycoproteins gives it the properties of a glue and binder that is edible by humans. Acacia gum has long been used in traditional medicine and in everyday applications. The Egyptians used the material as a glue and as a pain-reliever base. Arabic physicians treated a wide variety of ailments with the gum, resulting in its current name. It is even used as a lickable adhesive, for example on postage stamps, envelopes, and cigarette papers. Here, it really does help that Arabic Gum is not toxic. Generally, it gives body and texture to food products. It is also used in soft drink syrups. It binds the sugar to the drink and avoids it from crystallizing on the bottom. Because Gum Arabic also reduces the surface tension of liquids, it is usually responsible for increased foaming in carbonated beverages. All these technological characteristics of gum Arabic can be used in winemaking, where it has been introduced first as a crystal stabilizer and later became a tool to increase viscosity and ameliorate the perlage of sparkling wines.



Arabinol Arôme: The market is constantly looking for fresh and fruity wines, where the aromatic component is fundamental. To create wines high in aromatics, winemakers use techniques such as cold macerations, fermentation at low temperatures, aromatic yeasts, treatment of the lees, etc. To protect these wine aromas, AEB has enhanced a technology used in the perfume industry: the utilization of gum Arabic as an aroma protecting substrate. Not all Arabic gums provide aroma protection because the property is lost when placed in a hydro alcoholic solution. Arabinol Arôme is formulated to retain

these characteristics in wine and to preserve all the aromatics naturally present in the bouquet. Add to red, white and rosé wines, even when stored in partially filled vessels.

Utilization: dilute 1:10 in wine to improve homogenization. Best timing for addition is after ML and before bottling. It is suitable for wines that undergo membrane filtration. Do not add Arabinol Arôme right before clarification because treating wines with polysaccharides before bentonite and fining agents additions can slow down their settling.

Dosage: 50-200mL/hL (0.5-3.6 gallons of product per 1,000 Gallons of wine), equal to 550-2200 ppm or 4.5-18 lb./1,000 gallons.

Shelf life and storage: once opened Arabinol Arôme should be used within 30 days. If a container is left open for a longer time, add 1000 ppm of SO₂ to extend life span.

Packaging: 10 and 25 kg pails



Arabinol: gum Arabic was introduced in the wine industry to help improve tartrate stability. The long polysaccharides contained

in this product act as colloid protectors and prevent or slow down the reactivity of different molecules. When added to wines, Arabinol slows down aggrega-

tion of crystals of tartrates. It also diminishes the perception of astringent and bitter tannins. It can be used on whites and reds when there is a need to improve viscosity. Because Arabinol has one of the biggest polysaccharide molecules in the market, it is exceptionally viscous and "sweet". It is very important to run bench trials against other products in order to calibrate dosage and flavor. When added to sparkling wines, Arabinol improves the finesse of the perlage. In young red wines and rosé, it also improves color stability.

Utilization: Add to finished red and white wines that are stable and ready to be filtered. Addition should be done after diluting 1:20 in wine in order to improve homogenization of the product. It is suitable for wines that undergo membrane filtration. Do not add Arabinol right before clarification; addition of polysaccharides before bentonite and fining agent additions can slow down settling.



Dosage: 50-200mL/hL (0.5-3.6 gallons of product per 1,000 Gallons of wine), equal to 550-2200 ppm or 4.5-18 lbs./1,000 gallons. Shelf life and storage: once opened Arabinol should be used within 30 days. If a container is left open for a longer time, add 1000 ppm of SO₂ to extend life span.

Packaging: 10 or 25 kg pails and 230 kg drums.



Arabinol HC: is a solution of about 33.5% gum Arabic, mostly composed of polysaccharides with high molecular weight. After their hydrolysis they release non-fermentable sugars, contributing to the softness and sweetness of the mid-palate in the wines treated. From a chemical point of view, Arabinol HC, is a chain of D-galactose, a non-fermentable monosaccharide sugar that is about as sweet as glucose, and about 30% as sweet as sucrose. These D-galactose units are ramified with D-glucuronic acid (monosaccharide), with l-rhamnose (pentose) or l-arabinose (pentose) final units. The characteristics of this premium gum Arabic are derived from the unique composition of the soil where the Acacia grows. In fact, Arabinol HC is derived from trees that grow in presence of Rhizobium Leguminosarum on their roots, able to fix the atmospheric N. The combination of these characteristics, with the application of other farming techniques, results in an increase of N and Mg. The presence of such compounds modifies the soil pH, increasing the concentration and solubility of salts near the plant and consequently the pH of its lymph. This will ultimately yield a gum with higher softening and stabilizing power.

Utilization: Add to finished red and white wines that are stable and ready to be filtered. Addition should be done after diluting 1:20 in wine in order to improve homogenization of the product. At lower dosages (200-300 ppm) it is suitable for wines that undergo membrane filtration. Do not add Arabinol HC right before crossflow filtration or clarification: addition of polysaccharides before bentonite and fining agent additions can slow down settling.

Dosage: 30-150mL/hL (0.3-2.7 gallons of product per 1,000 Gallons of wine), equal to 350-1700 ppm or 3-14 lbs./1,000 gallons.

Shelf life and storage: once opened Arabinol HC should be used within 30 days. If a container is left open for a longer time, add 1000 ppm of SO₂ to extend life span.

Packaging: 1 kg bottles and 25 kg pails.

NEW!

Arabinol Super Rouge: is a solution of gum Arabic Senegal with a high content of L-Arabinose (above 45%) and L-Rhamnose (above 18%): these are monosaccharides with a noticeable sweetening and softening power, making it ideal for red wines, even with a high tannin content, where it gives a pleasant sensation of body and volume. The action of Arabinol Super Rouge is highlighted not only at the palate, but also in the color, as its addition enables the stabilization of that chromatic component that in young wines or in some specific varieties would tend to precipitate over time.

Utilization: Arabinol Super Rouge should be added to already perfectly clear wines before or after the last filtration. No clarification must be carried out after its addition. It is suggested to carry out a filterability test before submitting the wine to a membrane filtration.

Dosage: From 20 to 150 g/hL. 1.5-12 lbs/1,000 gallons.

1000 ppm will bring 4 ppm of SO₂ to the wine.

Shelf life and storage: once opened Arabinol Super Rouge should be used within 30 days. If a container is left open for a longer time, add 1000 ppm of SO₂ to extend life span.

Packaging: 25 kg net drums

Arabinol Multinstant: is a micro-granulated gum Arabic, extracted from Acacia Senegal and refined. It does not contain SO₂ or other preservatives and is able to enhance in the best way the potentialities of white and red wines. It displays a protective action towards the molecules responsible for the color, that are kept stable during time, facilitating the processes of natural evolution and preventing the formation of proteic, copper and ferric colloids. Arabinol Multinstant reacts in combination with metatartaric acid and strengthens its action, prolonging the length of the effect, as it wraps up tartaric crystals and keeps them soluble. Thanks to its complex polysaccharidic nature, it gives fullness and harmony to wines and softens tannic roughness.

Dosage: 12 - 36 mL/hL (1-3 lbs./1000 gal)

Shelf life and storage: Store in a cool dry place for maximum 2 years.

Packaging: 20 kg net bags

Polysaccharides:

peptides and yeast derived mannoproteins

The refinement is a fundamental stage in the wine evolution, as it allows winemakers to highlight the qualities of wines and to increase their stability over time. One of the most common practices for the obtainment of full-bodied and harmonious wines with an intense and varietal aroma, is the *bâtonnage*, an oenological technique with a long tradition in Burgundy, consisting in keeping the wine in contact with the lees for several months and periodically re-suspending them by means of a gentle stirring. Its utilization at the end of the alcoholic fermentation allows to prolong the anti-oxidizing action carried out by SO₂.



AEB mannoproteins contained in the *Bâtonnage* line are immediately soluble and therefore eliminate the time, labor and barrels needed in traditional aging on lees. The peptide Glutathione is naturally contained in these products and provides protection against oxygen since the early stages of winemaking and also extends the shelf-life of the finished wines.

	APPLICATIONS	SUGGESTED WINES	SWEETNESS	UMAMI
ELEVAGE GLU	STRONGEST PROTECTION AGAINST OXIDATION, ADDS SWEETNESS AND MID-PALATE.	AROMATIC WINES IN NEED OF PROTECTION FROM COLOR AND AROMAS OXIDATION	++	0
BATONNAGE PLUS TEXTURE	AROMATIC PROTECTION, COLLOIDAL STABILITY, REDOX STABILITY, STRUCTURE.	FERMENTATION OF REDS AND WHITES IN ORDER TO STABILIZE COLOR AND AROMAS AND TO BUILD VOLUME	++	+
BATONNAGE PLUS STRUCTURE	IT BRINGS A MODERN NOTE OF CHOCOLATE, SOFTNESS AND STRUCTURE.	WINE WITH VEGETAL AROMAS AND IN GENERAL TO AGE REDS THAT DON'T HAVE THE RIGHT "KICK" (LENGTH, BODY)	+++	+
BATONNAGE PLUS ELEVAGE	HIGHLIGHTS FLAVORS, SOFTNESS AND STRUCTURE, CLEANS AROMA.	WHITES AND REDS IN NEED OF ROUNDNESS AND STRUCTURE	++++	+

Characteristics of yeast-derived polysaccharides



Elevation Glu: is a yeast derivative with a high percentage of the antioxidant tripeptide glutathione. It can be used to improve mid-palate, but this product is especially geared for protecting from oxidation and to reduce the need for SO₂. This technology is based on yeast extracts from a specific yeast strain from our collection (Glutaferm 1), rich in smooth polysaccharides and active antioxidant properties. In fact, the molecules extracted are extremely rich in reduced glutathione. Glutathione has been introduced in winemaking by OIV in 2015 and as confirmed in the literature, it protects red rosé and white wines from oxidation; extending the life of aromas and color alike. In Principles and Practices of Winemaking it is observed how “the extent to which oxygen uptake results in browning depends on the formation of a colorless reaction between oxidized caftaric acid and the peptide glutathione. Glutathione couples with oxidized caftaric acid and regenerates hydroquinones, which are uncolored, preventing browning (Singleton et al., 1984)”. Other research from Denis Dubourdieu, professor of oenology at the university in Bordeaux, already claimed that: “higher levels of glutathione in Sauvignon Blanc wine at bottling prevent the color from yellowing, dissipation of the varietal aroma, and the wine tendency towards developing aging defects”. For best results, to give time to the GSH to be dissolved, add Elevation Glu 24 hours before the antioxidant effect is desired.

Dosage: 12-30 g/hL; 1-2.5 lbs/1000 Gal.

Shelf life and storage: Elevation Glu can be stored at room temperature and low humidity for two years.

Packaging: 500 grams packets and 5Kg bags

Highlights:

- As aroma, especially thiols, oxidize easily, we suggest an addition of Elevation Glu 2-3 days before the end of fermentation in order to reduce redox potential and to protect from possible oxidation.



Batonnage Plus Elevation: is made from yeast cells that are rich in peptides, mannoproteins and antioxidant amino-acids. It increases the positive effect of the sur-lie, making wines more viscous and harmonious. Its utilization at the end of the alcoholic fermentation allows to prolong the

antioxidizing action carried out by SO₂. At the same time, the activity of Batonnage Plus Élevage prevents the formation of mercaptans and enhances the bouquet of the varietal. In wines treated with Batonnage Plus Élevage, color appears to be more stable and less subject to browning and pinking.

Dosage: 10-30 g/hL 1-2.5 lbs/1000 Gal.

Shelf life and storage: Batonnage Plus Elevage can be stored at room temperature, low humidity for two years.

Packaging: 5 Kg bags



Batonnage Plus Structure: It's an yeast auto lysate blended with "mocha" ellagic tannins. After years of experience we can claim that this product fixes most aromatic faults in red wines and especially the green notes attributed to methoxypyrazines. It is a yeast preparation combined with highly toasted ellagic tannins that mask the vegetal notes and promotes fruity and chocolate-like aromas.

Utilization: Re-hydrate in warm water (35°C/95°F) or wine, for 1/2 h before mixing. Then dilute 1:10 in wine and add directly to the tank or barrel. Once homogenized it doesn't need further stirring. Some particles derived from the yeast cells are not completely soluble, so a good racking or filtration are needed before bottling. Wait at least two weeks before sterile filtration.

Dosage: 10-30 g/hL 1-2.5 lbs/1000 Gal.

Shelf life and storage: Batonnage Plus Structure can be stored at room temperature, low humidity for two years.

Packaging: 5 Kg bags



Batonnage Plus Texture: polysaccharide based, autolyzed yeast product, rich in mannoproteins. It gives a sweet and viscous texture to red, white and rose' wines. It brings a sweet texture due to the large size of the molecules that it releases, that exceed 100 Kilo Dalton. When added to fermenting musts it improves the structure and in red wines helps color stabilization. It also has strong antioxidant proprieties.

Utilization: Re-hydrate in warm water (35 °C/95°F) or wine, for 1/2 h before mixing. Then dilute 1:10 in wine or must and add directly to the tank or barrel. Once homog-

enized it doesn't need further stirring. Some particles derived from the yeast cells are not completely soluble, so a good racking or filtration is needed before bottling. Wait at least two weeks before sterile filtration.

Dosage: 10-40 g/hL (1-3 lbs./1000 Gal.)

Shelf life and storage: Batonnage Plus Texture can be stored at room temperature and low humidity for two years.

Packaging: 20 Kg bags



Super-mann: is a pure mannoprotein that, thanks to its high colloidal power, improves tartaric stabilization. Thanks to its specific tactile sensation, Super-mann also very much contributes to softening the wine, smoothing the roughness deriving from an excess of acidity or tannins. In red wines, thanks to the high colloidal power, it interacts with polyphenols making the color more stable.

Usage: Re-hydrate in warm water (35°C/95°F) or wine, for 1/2 h before mixing. Then add directly to the tank or barrel. Once homogenized it doesn't need further stirring. Some particles derived from the yeast cells are not completely soluble, so a good racking or filtration are needed before bottling. Wait at least two weeks before sterile filtration.

Dosage: White wines: 10 - 25 g/hL. 1-2lbs/1,000 Gallons

Red wines: 10 - 40 g/hL 1-3lbs/1000 Gallons. TTB allows 400 ppm max to be used pre bottling

Shelf life and storage: Super-mann can be stored at room temperature and low humidity for two years

Packaging: 1 kg packets

CHAPTER SEVEN

**Stabilizers &
Finishing Agents**

STABILIZING AGENTS

FINING/STABILIZING ACTION	MEAN	ACTIVE INGREDIENT	COMMERCIAL NAME
COLD STABILITY (STABILIZATION OF TARTRATES)	BY AVOIDING GROWTH OF THE CRYSTALS USING A POLYSACCHARIDE THAT CAN COAT THEM	METATARTARIC ACID	CREMOR STOP EXTRA
		CARBOXYMETHYL CELLULOSE	NEW-CEL
	BY ACCELERATING FORMATION AND PRECIPITATION OF TARTRATES IN TANK	CREAM OF TARTAR IN A PROPRIETARY BLEND	CRYSTALFLASH
	BY REMOVING POTASSIUM TO AVOID FORMATION OF POTASSIUM TARTRATES	ION EXCHANGE	STABYMATIC
VA & RE-FERMENTATION CONTROL CONTROL	BY KILLING GRAM POSITIVE LACTIC BACTERIA	LISOZYME	LYSOCID
	BY KILLING AEROBIC MICROORGANISMS FORMING FILM ON TOP OF PARTIAL VESSELS	ALLYL ISOTHIOCYANATE	STERYL
	BY KILLING YEAST AND INHIBITING BACTERIA	SORBATE & KMS	MICROCID
	BY INHIBITING YEAST AND BACTERIA IN BARRELS	KMS IN PELLETS DOSED FOR BARRELS	SULFIGRAIN
	BY INHIBITING YEAST AND BACTERIA ON GRAPES	KMS AND ASCORBIC MIXED WITH DISPERSION AGENT (PERLITE)	AROMAX B4
TO CLEAN THE WINE FROM REDUCTIVE AROMAS	BY CATALYZING OXYGEN ACTIVITY	LIQUID COPPER SULPHATE	DESULFIN
TO DROP ACIDITY	BY DROPPING TARTARIC ACID	POTASSIUM BICARBONATE IN PROPRIETARY BLEND	DEACID
BRETT AND SMOKE TAIN T CONTROL	BY ADSORBING VOLATILE PHENOLS LIKE 4-ETHYLPHENOL/GUAIACOL, GUAIACOL AND 4-METHYLGUAIACOL	ADSORBING MEDIA DERIVED FROM SACCHAROMYCES CEREVISIAE	ANTIBRETT
	BY KILLING BRETTANOMYCES AND ADSORBING ODORS	CHITOSAN AND ADSORBING MEDIA DERIVED FROM SACCHAROMYCES CEREVISIAE	CHITOCEL
LEES COMPACTION	BY BINDING PROTEINS LIKE GELATIN, ALBUMIN AND CASEIN	SILICA	SPINDASOL

FINING AGENTS

PRODUCT	COMPOSITION	ACTIVITY	VEGAN
BENTOGRAN	NA-BENTONITE	ELIMINATES UNSTABLE PROTEINS	Yes
CATALASI	BENTONITE, POTASSIUM CASEINATE, GELATIN, ASCORBIC ACID, KMS	REDUCES OXIDIZED PHENOLICS	No
CATALASI AF PLUS	BENTONITE, ISINGLASS, PORK GELATINE, PVPP, SILICA GEL	ABSORBS OXYDIZED AND ASTRINGENT TANNINS, REMOVES EXCESSIVE PROTEINS, COMPACTS LEES, ADSORBS ODORS	No
CARBOSIL	LIQUID SOLUTION OF DECOLORIZING CARBON AND SILICA	REMOVES COLOR AND HELPS SETTLING DURING MUST FINING OR FERMENTATION	Yes
CATALASI VEGA	BENTONITE, PEA PROTEINS, PVPP, SILICA GEL	PREVENTS PINKING, OXIDATION AND PROTEIN HAZE	Yes
DECORAN GRAN	PELLETIZED CARBON	REMOVES COLOR	Yes
GELSOL	HYDROLIZED LIQUID GELATIN	REMOVES SOLIDS IN MUST FINING	No
MICROCEL	BENTONITE, POTASSIUM CASEINATE, CELLULOSE	ABSORBS OXYDIZED AND ASTRINGENT TANNINS, REMOVES EXCESSIVE PROTEINS, COMPACTS LEES	No
MICROCEL AF	BENTONITE, PVPP, CELLULOSE	ABSORBS OXYDIZED AND ASTRINGENT TANNINS, REMOVES EXCESSIVE PROTEINS, COMPACTS LEES	Yes
QUICKGEL AF	PORK GELATIN AND YEAST DERIVED PROTEINS	SMOOTHS EDGED IN FINISHED RED WINES	No
SPINDASOL	30% SILICA SOLUTION	MOSTLY USED TO COMPACT LEES ESPECIALLY DURING MUST FINING.	Yes
VE-GEL	PEA PROTEINS	MOSTLY USED IN MUST FINING TO SUBSTITUTE PORK GELATIN	Yes

In juice and wine production, processes include clarification and stabilization. In the simplest terms, clarification is defined as a separation of solids from liquid. All wines contain some dispersed entities of colloidal size that affect wine texture, taste, clarity, stability and production efficiency. In addition to being clear, wines must also be made physically stable before they are bottled.

- The aim of wine clarification is to remove suspended and colloidal particles in the wine that create turbidity and to remove unstable proteins or other macromolecules that can later denature or aggregate and cause the wine to appear hazy once bottled.
- The objective of stabilization is to ensure that wine retains its clarity during aging and storage, independent of reasonable temperature, oxidation, lighting and microbial conditions.

Must protection:

Aromax B4: ascorbic acid and potassium metabisulfite immobilized on an inert substrate for easy dispersion on grapes and juice and protection during machine harvesting or grapes transportation. It optimizes anti-oxidation and antiseptic protection. The perlite used to immobilize the ascorbic acid and the potassium metabisulfite floats,



only releasing the components when they are wetted by the juice. In this way it forms a protective layer on the wetted surface of broken berries, juice in the gondolas, or holding tanks.

Utilization: Disperse the powder on the bins, boxes, trucks, and conveyers or at any stage that needs antioxidant protection for the juice.

Use at 0.5-1 kg/Ton. (1 Kg/Ton will release 54 ppm of SO₂ and 60-70 ppm ascorbic).

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

Packaging: 5kg bags

Tartrates Stabilization:

Cremor Stop Extra 40*: it's an "old school" tartrate stabilizer, not even included in the TTB list of approved materials for winemaking usage in USA.

Cremor Stop Extra 40 is an extremely pure metatartaric acid with a very high esterification index. The efficiency of metatartaric acid depends on the amount of active hemipoly lactide it

contains and the degree of condensation. Control of the quality of metatartaric acid preparation is based on measuring their esterification index or percentage of esterified functions. The most active products, like Cremor Stop Extra 40, have an esterification index of 38-40%. It requires twice as much of the lesser quality product (esterification index at 30%), to obtain the same protection.



It is recommended to add Cremor Stop Extra 40 always after the addition of organic and inorganic clarifiers, de-acidifying products, decolorizing or deodorizing carbons. A filtration carried out 12-24 hours after the addition of Cremor Stop Extra 40 eliminates the possible occurrence of opalescence, caused by the high esterification index and by the presence of proteic substances in the wine.

Utilization: dissolve the product in cold water at about 1:5. Avoid using hot water and always make a fresh solution every time. Add to the wine by pumping over or through a Venturi pipe. Do not use in wines rich in calcium or stored in concrete tanks. An addition of 55 ml/hL (5 lb./1000 Gal) of Arabinol makes Cremor Stop 40 even more stable in time.

Dosage: 10 -15 g/hL (1lb/1000 Gal)

Shelf life and storage: sealed containers will last for 2 years stored at room temperature in a non-humid environment. Temperature should not fall under 5°C/41°F.

Packaging: 1kg packets

***Not legal for U.S. commercial wineries.**

Crystalflash: potassium bicarbonate, tartaric acid and neutral potassium tartrate, plus bentonite, for optimized tartrates seeding and settling. It accelerates the crystallization of tartaric acid salts, potassium bitartrate and neutral calcium tartrate, in wines during refrigeration. Can induce in the cold wine (around freezing temperature), the instantaneous formation of a very thick cloud of rising micro-crystals, facilitating the first and more delicate stage of the nucleation process.

Thanks to its balanced and exclusive formulation, Crystalflash eliminates the occurrence of oxidative phenomena in the wines going through cold stabilization. Also, Crystalflash shortens the cold holding time in a tank to a very short period, usually between 3 and 5 days.

Dosage: 20 and 40 g/hL (1,5 – 2,5 lbs./1,000 Gallons).

Shelf-life and storage: 4 years stored at room temperature in a non-humid environment.

Packaging: 1 kg packets

CRYSTALFLASH COMPOSITION		
INGREDIENT	%	PURPOSE
POTASSIUM BICARBONATE	40%	HELPING TO DISPERSE THE PRODUCT, ALSO CRYSTALYZES TARTRATES HELPING PRECIPITATION
CREAM OF TARTAR	30%	HELPS NUCLEATION
BENTONITE	15%	HELPS SETTLING
POTASSIUM TARTRATE (TARTARIC ACID)	10%	WORKS IN SYNERGY WITH CREAM OF TARTAR TO SPEED UP NUCLEATION AND BALANCES ACIDITY
CELLULOSE	5%	HELPS DISPERSION

New-Cel: CMC based New-Cel is a colloidal protector that wraps the tartrates crystal structure with a protective film and deforms them making their growth impossible. Studies (Malherbe & O’Kennedy, 2008) have demonstrated the savings when using this technology instead of the traditional cold stabilization, with CMC treatment costing 8-10 cents/gallon, while traditional “chilling” was about four times the cost in energy. New-Cel has been developed by AEB considering that the most effective wine stabilization occurs when the CMC polymer contains a ratio between the number of carboxylated groups and glucose units equal to 1. This allows the ultimate efficacy in forming a chemical barrier between the crystals of potassium bitartrate preventing their enlargement. CMC is negatively charged so it will bind molecules like proteins (but also unstable color in reds). If the wine is perfectly protein/color stable there will be no problem, but if is borderline, CMC will cause haze that needs to be filtered. We recommend checking protein stability after CMC addition on a sample and make sure protein haze doesn’t develop. It can be used in sparkling wines by adding it a few days before the riddling agents or in the liqueur d’expédition at the dégorgement. CMC is approved in the US under 27 CFR 24.250.

Utilization: Directly dissolve the solution into the wine 48 hours before bottling or before any filtration stage. Wines must be brought at 16°C-64°F for 8 hours for CMC to dissolve. Wines must be protein stable and with turbidity <1NTU. In reds CMC may interact with unstable color making it precipitate. Stabilize the color with tannins, MOX, Arabinol, prior to CMC addition in red wines.

Dosage: 100-150g/hL or 8/12 lbs./1,000 Gallons. TTB limit = The amount used must not exceed 0.8% of the wine.

Shelf life and storage: 1 year at room temperature in a non-humid environment.

Packaging: 1 kg bottles and 25 kg pales

Highlights: A comparative trial on available techniques to achieve cold stability was performed by AEB in collaboration with Cal Poly Wine & Viticulture institute, on a Chardonnay from Santa Lucia Highlands. According to the conductivity tests, the control measured a 10.9% difference in conductivity, 6.9% above the threshold for cold stability. The results for the New-Cel additions showed successful stabilization of all wine samples with the lowest percentage difference of 1.4% and an average of 1.8% difference. The results for the mannoprotein products used as tartrate stabilizers,

showed that the wines were not fully cold stable as the lowest percentage difference was 5.8% and an average of 6% difference between all three repetitions made with mannoproteins. CMC guarantees stability of tartrates, however, according to those trials, the best technique available to winemakers to ensure cold stability was ion exchange.

Redox Adjustment:

Desulfin: stabilized liquid copper sulfate to remove H₂S and reductive odors. If wines show a bouquet that seems to be too “closed” or affected by reductive odors, try adding a drop of Desulfin in the glass. If the wine changes positively, the wine is most likely reduced by H₂S or mercaptans and can be treated with an adequate addition of Desulfin.

If the problem is mercaptans, do not aerate. Mercaptans can be removed to some extent with appropriate copper sulfate additions (about twice the one needed for H₂S removal). The reaction forms an insoluble Cu-mercaptide salt that can be filtered out of the wine.

If the problem is DMDS or DEDS, we need to convert them back to mercaptans with 500 ppm of ascorbic. This can take up to 60 days. After that we can use Desulfin.

Utilization: preliminary H₂S tests should be conducted. Add Desulfin directly to the affected product and circulate in an open environment.

Keep in mind that, according to TTB, the quantity of copper sulfate added (calculated as copper) must not exceed 6 parts copper per million parts of wine (6.0 mg/L). The residual level of copper in the finished wine must not exceed 1 part per million (1 mg/L). 21 CFR 184.1261 (GRAS). The addition of 10 mL/hL of Desulfin provides 0.25 mg/l of copper therefore the max addition rate of Desulfin is 40 ml/Hl (assuming that there is no copper in the wine already).

Bench trialing Desulfin: adding an average drop size (0.05 ml) into 1 liter equals to a Desulfin addition of 5 ml/Hl or 1/8 of the legal limit.

Average dosage: 10ml/hL or 0.38 ml/Gal

Shelf life and storage: Sealed containers will last for 2 years stored at room temperature in a non-humid environment. Temperature should not fall under 5°C/41°F.

Packaging: 1 kg bottles

SULFUR COMPOUND		ODOR
H ₂ S		ROTTEN EGGS
MERCAPTANS	METHYL MERCAPTAN	ROTTEN CABBAGE
	ETHYL MERCAPTAN	BURNT MATCH
	DMDS	COOKED CABBAGE, ONION
DISULFIDES	DEDS	BURNT RUBBER, GARLIC

Sulfur compounds and their characteristics.

Riduxhigh: antioxidant stabilizer to be used at bottling, it improves shelf life of white, reds and rosé wines. The vigorous anti-oxidizing action of Riduxhigh, drastically lowers the redox potential in just 24 hours and keeps it constant throughout time. The results are thus, improved wine color and bouquet stability along with enhancement of its organoleptic characteristics. It interrupts the chain reaction responsible for the formation of oxidized radicals and instantly re-establishes a stable oxygen-free environment, maintaining constant levels of SO₂. It also prevents the occurrence of ferric casse by keeping iron in a stable and soluble form. It contains 15% ascorbic acid, a strong antioxidant that can quickly reduce oxygen. This reaction is known to produce a strong oxidant, H₂O₂, and because of that, winemakers are afraid to use it. However, the oxidative species produced by the reaction between oxygen and ascorbic acid will react quickly with SO₂. For this reason, the SO₂ present in Riduxhigh, other than controlling the microbial environment, will optimize the efficiency of this product as an antioxidant.

Composition: citric acid, potassium metabisulfite, ascorbic acid, metatartaric acid.

10g/hL (0.8 lb./1000 Gallons) of Riduxhigh, increase the SO₂ by 17 ppm.

Dosage: white and rosé wines: from 100 to 250 ppm. Red wines: from 100 to 200 ppm. Dissolve in 10 parts of wine and add before micro filtering or bottling.

Shelf life and storage: 3 years if stored in a cool dry place, away from direct sunlight and heat.

Packaging: 1 kg packets.

Protection from wild yeast and bacteria:



Chitocel: is a product based on Chitosan, a natural polysaccharide of fungal origin (derived from *Aspergillus niger*), biodegradable and non-allergenic, that allows to reduce and, in some cases, to eliminate, the unwanted microbial population in wine. Chitocel is active against acetic and lactic bacteria, yeasts in general and specifically on *Brettanomyces bruxellensis*. Its action is mostly “physical” as there seems to be an electrostatic interaction between the membranes of the microorganisms and Chitocel, that would induce a strong disturbance in the permeability of the membrane of the *Brettanomyces*. This ultimately ends up forming a large floccule and can be eliminated by racking or filtration. It’s still possible to detect live cells of *Brettanomyces* after the treatment with Chitocel, but these cells are for the most part critically damaged and incapable of reproducing or to form volatile phenols (false positives). Thanks to the synergy with yeast hulls (deodorizing media), Chitocel reduces the content of 4-ethylguaiacol, 4-ethylphenol and contaminants such as ochratoxin A. Also, the use of Chitocel allows to reduce the content of heavy metals such as iron, lead, cadmium, copper, thus preventing the ferric casse and the copper casse.

Approved as acceptable in good commercial practice in the US under TTB § 24.250

Utilization: dilute 1:10 in must or wine and add to mass making sure to homogenize well. Leave it in the media for at least 10 days before filtering or racking.

Dosage: 120-180 ppm (1-1.5 lbs./1,000 gallons).

TTB limit for this product is 200 ppm.

Packaging: 250 grams



Scan the barcode to learn more about the properties CHITOCCEL in wine

Laboratory trial with Chitocel:

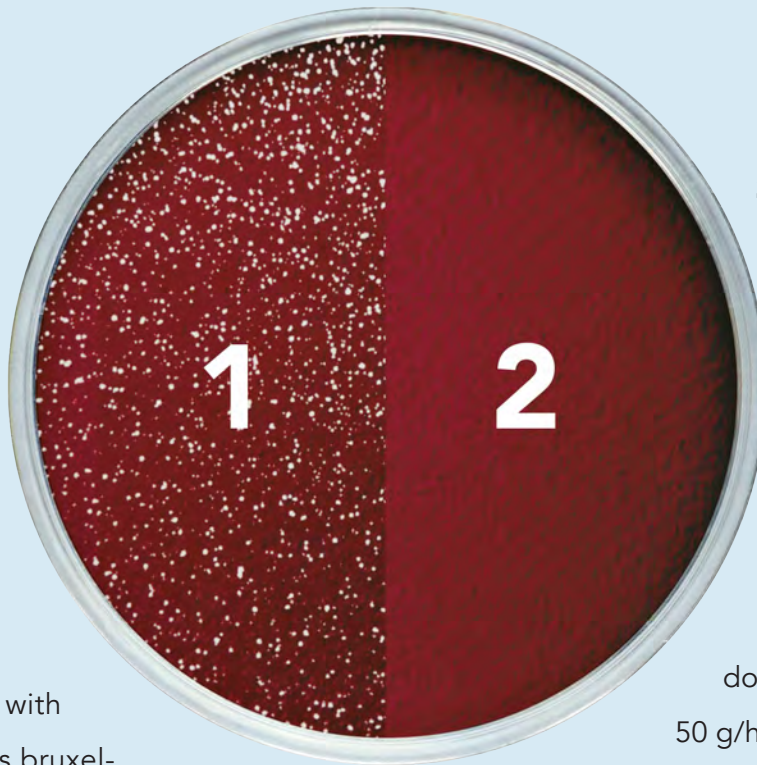
1. Application to a heavily contaminated wine with *Brettanomyces bruxellensis*.

- Matrix: wine strongly contaminated with *Brettanomyces bruxellensis*, with an evident olfactory imprint.

- Chitocel dosage: 5 g/hL. Contact time: 10 days. Temperature: 25 °C. Notes: daily shaking

- Analysis method: sterile filtration on a cellulose acetate membrane with 0.2µm pores. Plates incubation at 30 °C for 3 days on specific medium for *Brettanomyces* counts.

- Results: Cell count untreated sample = 3×10^3 CFU/l. Cell count treated sample = N/D



2. Application of Chitocel to a wine inoculated with a population of lactic bacteria

- Matrix: wine heavily contaminated with *Oenococcus oeni* (105 cells/mL).

- Treatments: Chitocel dosages of 30 g/hL and

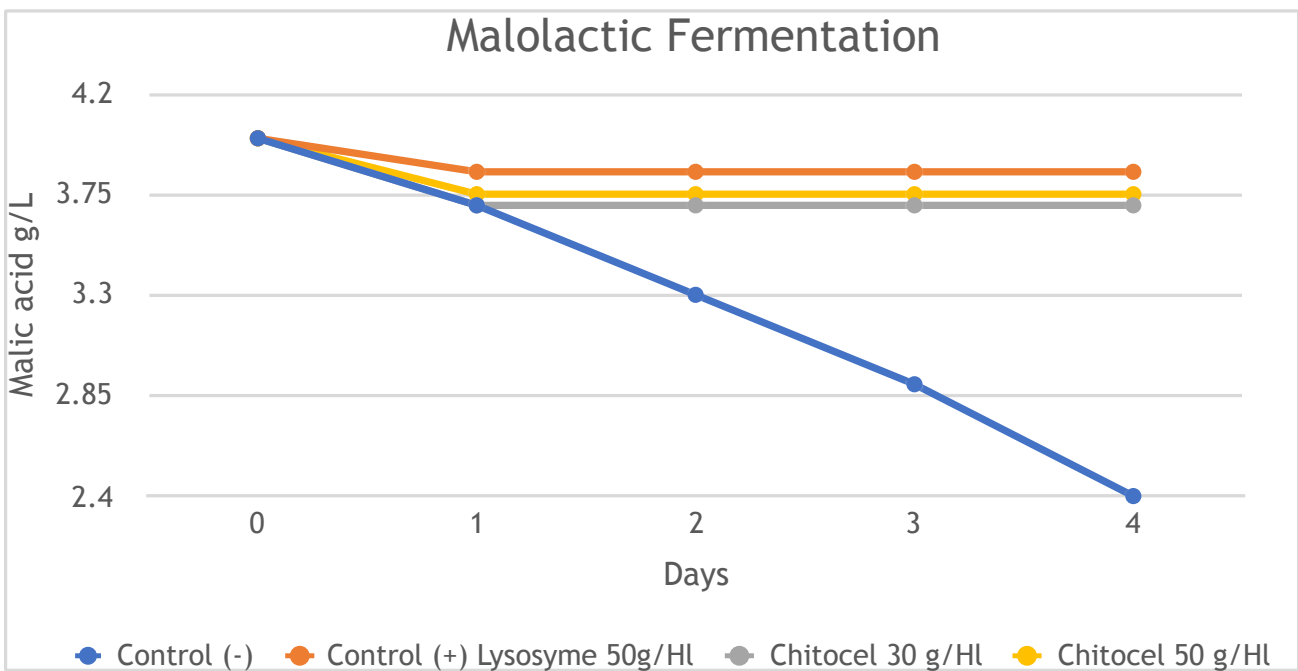
50 g/hL. Negative control: no treatment. Positive control: dosage

of 50 g/hL of Lysozyme. Contact time: 5 days. Temperature: 25 °C.

- Analysis method: Malolactic fermentation was measured by malic acid consumption and consequently lactic acid production. The total cell count was made on MRS plates.

- Results: Microbial metabolism is particularly vigorous in the untreated sample, which produced 1.5 g/L of lactic acid. Both Chitocel treatments showed instead a substantial inhibition of the conversion of malic acid to lactic acid, with comparable results to those obtained with Lysozyme. Chitosan application is therefore significantly efficient in red wine condition where interactions between phenolic compounds and lysozyme could occur, resulting in loss of color (Bartowsky et al. 2004).

	CONTROL (-)	CONTROL (+) LYSOSYME 50G/HL	CHITOCCEL 30 G/HL	CHITOCCEL 50 G/HL
0	4	4	4	4
1	3.7	3.85	3.7	3.75
2	3.3	3.85	3.7	3.75
3	2.9	3.85	3.7	3.75
4	2.4	3.85	3.7	3.75



Chitocel (30 and 50 g/hL) and Lysozyme (50 g/hL) effects on Malolactic fermentation (Malic acid)

Lysocid W: lysozyme enzyme 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.

Utilization: dissolve Lysocid W 1:10 ratio 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: 10-25g/hL (1-2 lbs./1000 Gal). To stabilize *Lactobacillus* during slow or stuck fermentation: 25-40 g/hL (2-3 lbs./1000 Gal).

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

Packaging: 1kg packs

Microcid: due to its potassium sorbate content, it helps preventing re-fermentation of wines containing residual sugars. Microcid inhibits bacterial alterations, by stabilizing free SO₂, thereby inhibiting the activity of lactic bacteria that metabolize sorbic acid. As a result, it prevents the formation of an anomalous odor, reminiscent of geraniums that can be derived from the usage of straight sorbate. Due to its reducing components (KMS and citric acid), it helps also to prevent oxidation and hinders increased volatile acidity.

Utilization: dissolve in about 10 parts of warm water and add uniformly to the clarified and filtered mass. 50g /hL – 4 lbs./1,000 Gallons of Microcid increases total SO₂ by 30 ppm and 270 ppm of sorbate.

Dosage: 25 – 50 g/hL (2-4 lbs./1000 Gal).

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

Packaging: 1 kg packets

Steryl*: prevents formation of films on the wine that is in contact with air. Comes in the form of tablets consisting of an inert pure-paraffin support in which allyl-isosulphocyanate, a natural form of mustard oil, has been dissolved. Mustard oil is a volatile substance with high antiseptic properties especially regarding aerobic microorganisms. Steryl anti-flor tablets are made with the most up to date techniques using fully automated systems, which guarantee consistent quality. The microorganisms responsible for the formation of white film on the surface of wines stored in partially full containers, belong to the species *Pichia*, *Hansenula* and *Candida*, they are yeasts with a prevalently oxidative metabolism and almost free from fermentative activity. In addition to the white film and oxidation, a loss of alcoholic content takes place as well as the formation of acetaldehyde, which gives a vinegary smell to the contaminated wines. By floating on the surface of the liquid, Steryl tablets slowly release the allyl isosulphocyanate, which sterilizes the air above it. As a result, the development of the film is inhibited together with other oxidation related bacterial and enzymatic surface alterations. ML bacteria as well as wine flavor in general are not affected.



Dosing: use one or two tablets of the adequate size, and replace it every 15 days.

Shelf life and storage: Packing in blister packs of aluminum and plastic laminate ensures unlimited preservation and maintains the efficiency of the product.

Packaging: Steryl tablets are contained inside practical packs and commercialized in three different packaging sizes, for casks, barrels and tanks of variable dimensions. Steryl Vasche (for tanks) N. 50 tablets in 50 x 1 tablet sachets, Steryl Fusti (for amphoras and large barrels) N. 80 tablets in 40 x 2 tablet sachets, Steryl Demijohns (for small containers) 600 tablets in 50 x 12 tablet sachets

***Not legal for US commercial wineries.**

Wine taint treatments: smoke, brett and methoxypyrazines

Antibrett: it cures smoke taint and Brettanomyces taint. These are two defects that are very hard to fine without using special equipment. The major indicator compounds associated with both these types of taint belong to the group called volatile phenols. In the case of Brettanomyces, the responsible compounds are 4-ethylphenol and 4-ethyl guaiacol; and in the case of smoke taint, guaiacol and 4-methylguaiacol. These molecules are similar. AEB has found a natural fining agent that can diminish (and in certain cases eliminate) the problems caused by these compounds.

Antibrett may be used as a preventive tool in contaminated barrels. It guarantees the inhibition of vinyl-reductase which is responsible for the transformation of naturally occurring cinnamic acids into the corresponding ethyl derivatives. Although it can be used to cure wines that already show taint problems, results may vary. Bench trials are always recommended before treating a full batch. Independent trials have shown that Antibrett always reduces at least 20% of the total volatile phenols in the wine, allowing to reclaim wines spoiled by Brettanomyces and smoke-taint contamination.

Utilization: Dissolve 40g/hl or 3 lbs./1,000 Gallons in 10 parts of wine or demineralized water and add to the mass making sure it is well homogenized. Wait at least two weeks before assessing results. Filter before going to bottle but at least 2 weeks after addition.

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

Packaging: 500g can or 5 kg bag.

Traditional fining of musts and wines:

Bentogran: is a pharmaceutical grade Na-bentonite for protein removal with low impact on the wine aromatics.

Protein content in musts or wines, especially in whites, is usually around 50-200 mg/L, with peaks that can range from 10 to 300 mg/L. Protein-related instabilities in wines are caused by thermo-labile proteins. Haze may arise when there are extreme conditions of storage/ shipping, where the temperature is not very well controlled. At wine pH, proteins precipitate with tannins and this is what creates haziness in wines. Research and expertise have brought AEB to find a very active grain of montmorillonite, with extremely high adsorbing properties that optimize protein stabilization with minimal impact on the wine treated.

Bentogran is used at rates of addition that are up to 50% less than regular Na-bentonites, with very compact sediment thus minimizing the lees. Compact sediment and lower dosage rates will result in decreased wine loss.

The active surface of Bentogran will be 3-4 times larger if compared to a regular bentonite. This characteristic will yield larger sized floccules with a higher clarifying power. Ultimately, by using less Bentonite-slurry in the fining process, less water will be added to the wine.

Bentogran is granulated and doesn't contain fine powder which are hazardous to the respiratory system. Bentogran is soluble-calcium free, soluble-sodium free, soluble-phosphates free, soluble-metals free, and arsenate-free. Free from dust, sand, and organic matters.

Utilization: rehydrate Bentogran for 20 minutes in 15-20 parts of cold or warm water (warm being more effective and faster than cold) before usage. Because of its high swelling power, Bentogran will increase its size 20 folds. To match this potential, it needs to be re-hydrated in a larger volume of water compared to other bentonites. When re-hydrating Bentogran, try not to use wine or hard water.

Dosage: 12-50 g/hL (1-4 lbs./1000 Gal).

Shelf life and storage: 4 years stored at room temperature in a non-humid environment.

Packaging: 1kg packs & 25 kg bags

Highlights:

sodium bentonite has enhanced protein binding capabilities over calcium bentonites and helps with a more homogeneous clarification.

Carbosil: is a liquid clarifier based on silica and decolorizing carbon. It allows a quick and efficient color removal in both musts and wines. Carbon is hydrated and in liquid form, so the product is safe and practical to use. It is highly recommended on musts of Pinot Grigio or those obtained from over-ripe grapes. It will yield a clear must/wine, with no trace of carbon and with a compact sediment.

Utilization: It may be used in cold settling along with Gelsol for must clarification or added during fermentation to reduce color. Mix Carbosil in must/wine using a Venturi or by pumping over. Dose the product either diluted 1:1 with water or full strength.

For solids and color fining: in musts, add Carbosil before adding gelatin. In wines, do the opposite; wait at least 1/2 hour after the clarifier (albumin, gelatin, casein) is fully homogenized, and then add Carbosil and mix.

Dosage: It always depends on the wine or must to be treated, and trials are recommended. As a rule of thumb, if used in combination with gelatin, Carbosil needs to be added at 5 to 10 times the amount of Gelsol used. When used as color remover during fermentation, rates of addition are between 250-600 ppm equal to 25-60 grams/hl or 2-5 lb./1,000 gallons. In liquid unit of measures, it would be 790-1,900 ml of Carbosil per 1,000 gallons.

Shelf life and storage: Sealed containers will last for 2 years stored at room temperature in a non-humid environment. Do not store below 5 degrees Celsius.

Packaging: 25 kg pails

Catalasi: to cure oxidized wines or to add "freshness" to fermenting musts. Used in fermentation it also helps preventing "pinking". It contains a balanced amount of Bentonite, caseinate, gelatin, L-ascorbic acid and potassium metabisulfite. It partially cures or prevents darkening of white wines, the occurrence of "brick" hues in rosé, and yellow hues in red wines. The potassium caseinate present in Catalasi highlights the original aromas and color, reducing the level of polyphenols and oxidized polymerized components. It also contains a strong antioxidant (vitamin C) and a calibrated dose of SO₂ important to neutralize eventual peroxides produced by the oxidation of vitamin C.

Utilization: Dissolve the dose of Catalasi in about 5 parts of cold water. Wait 15 minutes before use. Add quickly to mass with maximum turbulence in order to disperse before flocculation of the bentonite with the caseinate occurs.

Dosage: 200/500 ppm (20-50g/hL or 1.5-4 lbs./1000 Gal). 100 ppm or 0.8 lb./1,000 gallons of Catalasi, yield 5ppm of SO₂

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

Packaging: 1kg pack and 20 kg bags

Catalasi AF Plus: a mix of clarifiers (Bentonite, isinglass, pork/fish gelatine, PVPP and silica gel) that selectively removes green and bitter catechins from red rosé and white wines and cures light off flavors. The variety of agents that formulates Catalasi AF Plus, will give a balanced fining process, without the classic albumin and caseinate allergenic agents. It can be used in reds and whites for removal of bitterness and odd flavors deriving from reductive phenolics. Ideal also to ferment on for Pinot Grigio or in general for white and rosé wines with high phenolics.

Utilization: Dissolve Catalasi AF Plus in about 5 parts of cold water. Wait 10 minutes, mix and quickly add suspension to mass with turbulence (Venturi or pump).

Dosage: 200/500 ppm (20-50g/hL or 1.5-4 lbs./1000 Gal).

Shelf life and Storage: 2 years stored at room temperature in a non-humid environment.

Packaging: 1kg packet and 20 kg bags

Highlights: why PVPP? PVPP is a non allergenic, synthetic agent that, just like caseine and albumine, has a high affinity to bind short and bitter polyphenolic compounds, such as catechin, epicatechin, and quercetin. Reduces unwanted flavors, bitterness and astringency and removes oxidized polyphenols improving color.

NEW! **Catalasi Vega:** is a new clarifier for the cleaning and stabilization of musts and wines. The presence of vegetable proteins, PVPP, silica and activated Bentonite, guarantees the cleaning and stabilization of the treated products with just one operation. Catalasi Vega is active towards the oxidized phenolic substances giving the wine brown colors and bitter taste scents. It also improves protein stabilization and brightness thanks to the perfect removal of the finest turbidity particles. The treated wines are therefore fresher and franker; they fully express the varietal character and are stable over time.

Dosage: musts, from 50 to 100 g/hL (4-8 lbs/1,000 gallons). White, red and rosé wines: from 20 to 60 g/hL (1.5-4.5 lbs/1,000 gallons)

Utilization: Dissolve the dose of Catalasi Vega in cold water at the ratio 1:15, vigorously mix the solution and then add slowly to the wine.

Shelf life and Storage: 2 years stored at room temperature in a non-humid environment. Use 8-12 lb/1,000 gallons or 100-150 g/hL to reduce strong oxidative conditions and to prevent pinking.

Packaging: 10 kg net bags.

Deacid: a formulation of potassium bicarbonate and neutral potassium tartrate salts, both highly soluble, able to induce a decrease in the total acidity with neutralization reactions and a subsequent complete and quick precipitation of the salts. The wine acid profile is thus modulated, and the aromatic structure is not damaged.

The total acidity diminishes, and the pH will rise proportionally to the quantity of product applied. Deacid contributes to equilibrate the full body expression in all wines, eliminating green and aggressive notes, keeping the right freshness in whites and rounding excessively acid notes in red wines.

Utilization: add directly to the must or wine, little by little, by pumping over in order to avoid an excessive localized (but temporary) deacidification of a small amount of product. If used in solution, dissolve it in water. Pay attention to the development of CO₂ and the consequent increase in wine volume.

Dosage: 130 g/hL are required to lower the total acidity of 1 g/L (i.e. 1‰ in tartaric acid and 0,72‰ in sulfuric acid). Note: for higher additions, we recommend a preliminary laboratory trial.

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

Packaging: 5 and 25 kg bags

Decoran Gran: is an activated decolorizing carbon in mini pellets with high adsorbing action. It is ideal to remove excess color and reduce the level of polyphenols and catechins. This specifically activated decolorizing carbon can be utilized on both musts and wines, giving excellent results. Thanks to its form, Decoran

Gran eliminates the problem of powder dispersion in the environment, helps to avoid waste and eliminates discomfort for operators. These characteristics make it extreme-



ly easy to handle and to use, making cellar operations far more efficient. Thanks to a specific surface area of more than 1000 m²/g and a particle diameter from 10 to 100 Ångström, it ensures high decolorizing activity in musts, especially when treating higher molecular weight constituents such as polyphenols. It is chemically inert and has low transferable heavy metals.

Utilization: dissolve Decoran Gran in must, wine or water at a ratio 1:10 and add to the mass by pumping over. At the end of the absorption of the coloring matter, proceed with the removal by filtration or sedimentation-clarification.

Dosage: 50-1000 ppm (5 to 100 g/hL or 0.5-8 lb./1,000 gallons) depending on the decolorization to be obtained.

Shelf life and storage: 4 years stored at room temperature in a non-humid environment.

Packaging: 15 kg bags

Gelsol: a liquid gelatin produced by a process of irreversible hydrolyzation, that helps to maintain a constantly stable liquid product. The clarifying effect achieved through instantaneous flocculation results in the formation of large, heavy macro-coagula. Sediments are compact and easily filtered out. It is used alone or in conjunction with Spindasol in order to clarify white musts both in cold settling and flotation.

In reds it helps the wines to be softer and less susceptible to oxidation, Gelsol in fact removes small condensed tannins, which give most of the bitterness-astringency to wines. Gelsol has little affinity with anthocyanins; therefore, it is ideal for red wines because it does not cause any loss of color intensity.

Is a liquid gelatin, prepared enzymatically, without the use of heat. This difference makes Gelsol more active if compared with dry products where the use of high temperatures, denatures proteins making them less efficient.

Gelsol never sees the solid phase, and not only does this make it more efficient, but it also prevents re-condensation and the formation of "footballs" or "pyramids" inside the tank.

Utilization: Dilute in 1 to 3 parts of water before adding it to the wine, must or flotation equipment. In musts, add Spindasol or Carbosil before adding Gelsol. In wines, wait at least ½ hour after Gelsol is fully homogenized, and then add Carbosil or Spindasol and mix.

Dosage: It always depends on the wine or must to be treated, and trials are recom-

mended. Consider a specific weight of 1.2. For must clarification in combination with Spindasol, do trials starting from 60ppm or 6 g/hl (1/2 pound/1,000 Gal) of Gelsol and compact with 5 to 10 times the weight of Spindasol or Carbosil (specific weight of 1.15).

For both rosè and red wines fining trials, start from 30 ppm of Gelsol (10 ppm of Gelsol is equal to 7.7 ml/hl or about 0.1 gallon or 1 lb. for 1,000 gallons). Dosages of Spindasol for settling are only 3-4 times the amount of Gelsol used.

Must clarification (with Spindasol): begin trials at 5 ml/hL of Gelsol and settle with Spindasol at 5-10 X the weight of Gelsol.

Shelf life and storage: sealed containers will last for 2 years stored at room temperature in a non-humid environment. Do not store below 5 degrees Celsius.

Packaging: 10 and 25 kg pail

Microcel: to be added to white musts when they start fermenting, it diminishes the concentration of phenolics and proteins in the finished wines. It is also ideal to minimize the damage in wines derived from botrytized or moldy grape musts.

The main philosophy of the Microcel product is that modern winemaking usually prefers a preventive approach instead of a curative one. Using Microcel in fermentation of wine and rosé wines, winemakers stop oxidation at its onset. Also, a significative amount of proteins is taken out early on, before the risk of affecting the "finished" bouquet with heavy bentonite treatments.

Microcel is composed of Potassium Caseinate, active cellulose fibers, and micronized pharmaceutical bentonite. During fermentation, Microcel absorbs the proanthocyanidins and monomeric catechins, which cause oxidation in wines. The color of treated wines becomes more appealing with greenish hues in white wines or more defined pink hues in the case of rosé wines. Musts treated with Microcel produce more complex wines, which retain their individual characteristics longer.

Utilization: Dissolve the dose of Microcel in about 5-10 parts of cold water, wait approximately 15 minutes, add to mass quickly and with turbulence.

Dosage: 200/500 ppm (20-50g/hL or 1.5-4 lbs./1000 Gal).

Shelf life and storage: 3 years stored at room temperature in a non-humid environment.

Packaging: 10 and 25 kg bags

Highlights:

Why Potassium Caseinate? Using Potassium Caseinate during fermentation results in a lower level of catechins and therefore a finished wine that is going to be more resistant to browning and reduction. Potassium Caseinate also fines for copper as well as iron (up to 50% of the initial content).

Microcel AF: is the allergenic free version of the Microcel described above. The potassium is replaced by pure PVPP. The mix also includes bentonite and activated celluloses with a high adsorbing power. Thanks to the activity of PVPP, Microcel AF adsorbs catechins, preserving the product from oxidation risks and thus eliminating those yellow or orange and reductive smells.

Utilization: dissolve the dose of Microcel AF in about 5-10 parts of cold water, wait approximately 15 minutes, add to mass quickly and with turbulence.

Dosage: 200/500 ppm (20-50g/hL or 1.5-4 lbs./1000 Gal).

Shelf life and storage: 3 years stored at room temperature in a non-humid environment.

Highlights:

Why bentonite? the bentonite used in Microcel and Microcel AF is an extremely fine product selected to be very high in Na+. Having bentonite in the fermenting must is going to result in several advantages. It reduces the amount of bentonite required for protein stabilization; reduces oxidized polyphenols in botrytized grapes; adsorbs fungicides making it easier for the yeast to thrive.

Packaging: 1 kg packets

Spindasol W: liquid silica for extra compaction of settling agents or carbon fining.

When used in must, lees are heavier than when using just bentonite and the settling is much faster and compact. Also, silica is a mineral and does not adsorb aromatic mol-

ecules nor color. Because of its negative charge, it can be used in conjunction with gelatin, casein and albumin in order to achieve a more compact sediment, minimizing the lees. Using Spindasol to help settle the fining agents always improves the yield and reduces work.

Utilization: Mix Spindasol in must/wine using a Venturi or by pumping over. Dose the product either diluted 1:1 with water or at full strength. In musts, add Spindasol before adding Gelsol. This way gelatin will be neutralized on the silica and will interfere much less with the phenolics. To smooth out phenolics in finished wines, wait at least ½ hour after the proteic clarifier (albumin, gelatin, casein) has reacted in the media, and then add Spindasol to settle.

Dosage: it always depends on the wine or must to be treated, and trials are recommended. Generally, Spindasol needs to be added at 5 to 10 times the amount of the protein-based clarifier used. As a generic settling agent use 500 to 1000 ppm (1 liter is about 1.15 kg).

Shelf life and storage: Sealed containers will last for 2 years stored at room temperature in a non-humid environment. Do not store below 5 degrees Celsius.

Packaging: 10 and 25 kg pales

Quickgel AF: allergenic free clarifier for red musts and wines, with no significant impact on color. Extremely effective and quick, it's the best choice when winemakers need to clarify cloudy juices or wines in a very short time. It enables to obtain bright and softer wines with extremely compact lees. Thanks to the presence of specific quantities of bentonite, pork and fish gelatin, Quickgel AF helps to make sure that wines and juices are fined even with a high level of turbidity and polysaccharides. Quickgel AF forms a very compact "net" of flocculants, which gives the wines brightness, and makes it easier to filter them. The sediment left at the bottom of the tank will be very compact making it for an easy and clean raking. Filtration can be carried out 48 hours after addition without any problems in filtration flow rates.

Utilization: Dissolve Quickgel AF in ten parts of cold water and let it rehydrate for 20-30 minutes. Add the slurry to the tank, homogenizing with a pump over. Wait 48 hours before racking and filtering.

Dosage: 300-900 ppm (30-90 g/hl or 2.5-6 pounds/1000 gallons).

Shelf life and Storage: 2 years stored at room temperature in a non-humid environment.

Packaging: 500 grams and 10 kg packets.

Ve-Gel: clarification product based on vegetable proteins. Its high reactivity towards bentonite and silica enables to obtain a quick clarification with compact deposits. In must cold settling, Ve-gel enables to obtain not only a better technological result, but also more favorable parameters. The clarification achieved has lower NTU's than the ones obtained with common vegetable proteins, the deposit is more compact, and the clarification is carried out significantly faster. Thanks to its reactivity, Ve-Gel can be successfully utilized during flotation, alone or in association with bentonite. Ve-Gel has a low reactivity towards the coloring matter and can be used in red wines with virtually no color loss.

Usage: dissolve Ve-Gel in water at a ratio 1:15 and add it in-line.

Dosage: 100-500 ppm (10 to 50 g/hL or 0.8-4 lb./1,000 gallons)

Shelf life and storage: store in a cool dry place, away from direct sunlight and heat.

Packaging: 1 kg packs and 20 kg bags.

CHAPTER EIGHT

Filtration

Based in Copenhagen, Denmark, since 1986 DANMIL has been successful in supplying filtration products to the pharmaceutical, chemical and beverage industries, complying fully with the latest cGMP standards and governmental regulations.



A department of our production facility has been laid out to offer maximum flexibility for the production of custom-made products tailored to specific customer application needs.

All Danmil products are composed of the highest quality materials and conform to:

- 21 CFR-177 FDA food & drug contact regulations
- Latest USP class VI-121 °C systemic Injection Test – Intraperitoneal Administration
- Cytotoxicity Growth Inhibition Test
- Physicochemical test (USP 27) chapter < 661 >
- FDA LAL – Guideline (3) and USP
- Reverse Mutation Assay using Bacteria

Our achievements are measured and checked according to current FDA, USP, ASTM and Governmental legislations by a registered independent cGMP laboratory.

Range of products:

Filtration Cartridges:



Absolute PES final membranes: Hydrophilic polyethersulfone membrane with asymmetric pore structure, with no electric charge.

- Absolute porosities available: 0,2µm - 0,45µm - 0,65µm - 0,8µm - 1,2µm
- Membrane integrity testable multiple times.
- Wide compatibility with regenerating and sanitizing products.
- Food grade.

- Configuration suitable for frequent chemical regenerations using AEB Membrane UF.
- The membranes used in ABSOLUTE PES cartridges are tested and validated.
- All ABSOLUTE PES cartridges are subjected to a double integrity test:
 - every single module before assembly
 - the entire filter element assembled before delivery

This exclusive DANMIL validation system ensures the absolute integrity of the filter element.

Absolute AEB PES cartridges integrity test

- Wash the line for 3-5 minutes opening and closing the exit valve. This step needs to insure the cartridge membrane is well wet.
- Reach 1/1.5 pressure.
- Close water inlet in the housing and purge out most of the excess water, opening the Nitrogen valve next to the manometer.
- Close the outlet valve in the housing and generate a pressure (1.5 bars for 0.45 and 1 bar for 0.65) using the nitrogen valve next to the manometer.
- Open the outlet valve and check for pressure fall.
- If the pressure holds for 5 minutes the cartridge is ok. If the pressure falls it means that there are pores bigger than 0.45 or 0.65 (depending on what membrane was tested) and the filtration is no longer absolute.

Settings for automatic integrity testers:

- Test program: pick the number you'd like to assign to our cartridges
- Pore size: 0.45
- Maximum diffusion per filter cartridge built into the housing: 25 liters/minute if using air, 23 liters/minute if using Nitrogen
- Test pressure: 1,400 millibar (for the .45 cartridge)
- Number of cartridges: this is how many cartridges you have in the housing
- Net volume: to calculate this you'll have to find out the volume of the housing (written in the housing itself)



Scan the barcode to watch the Integrity test video tutorial

or in the literature provided by the housing manufacturer) and subtract the volume occupied by the cartridges (which is equal to 2,559 x number of cartridges in the housing).

- Stabilization time: 60 seconds
- Test time max: 300 seconds
- Standard pressure: 1,000 mbar



Absolute PP pre-filter cartridges:

- Thermo-welded polypropylene filter plate, with no electric charge
- Porosity 0,6 - 1 - 3 - 5 - 10 - 20 μm , with absolute particle degree β 5000
- Wide compatibility with regenerating and sanitizing products
- In accordance with regulations for contact with food
- Configuration suitable for frequent chemical regeneration
- Absolute PP filter elements can be repeatedly regenerated also in back-flow,

sanitized with hot water max 80°C, sterilized with steam up to 121°C. They can also be used in hot caustic cycle, even with peroxide.

Regeneration of filtration cartridges:

Always make sure to give a first rinse with cold water to remove dirt and avoid “cooking” proteins with hot water. Start washing with cold water in the same direction used for filtering the wine. Every filtering unit (housing) needs to be washed separately so that dirty water isn’t pushed into another unit. The flow should be equal to 1.5 the flow used during bottling. During the wash it is recommended to partially close the butterfly valves on the outlet of the housings in order to create a good turbulence. When done perform the same process but using hot water (50-60°C) and with a caustic cleaner like Membran UF.

Highlight:

- Pre-filters resist to back-flow regeneration better than membranes.

Membran UF: medium alkalinity and high sequestering liquid detergent, to be used for the cleaning of membranes in all sectors of food industries, beverage bottling and pharmaceutical.

Membran UF is able to easily remove organic and inorganic residues from membranes, restoring the normal flow levels. It's suitable also for hard waters.

Technical characteristics: physical appearance: light yellow clear liquid pH (1% solution at 20°C): 12,0 ± 0,5 Relative density at 20°C: 1,25 ± 0,05 Conductivity 1% sol. at 25°C: 6,9 mS/cm.

(The above indicated chemical-physical data represent the typical product's characteristics drawn from the analysis carried out on the product. These values are not a specification).

Directions for use:

Use Membran UF at variable concentrations from 0,5 to 1%. We suggest temperatures between 40 and 60°C with recycling times of at least 40' in the case of UF and MF Membranes.

Handling and storage: store in the original containers and avoid extreme temperatures. Consult the Material Safety Data Sheet.

Filtration sheets and pressure filters:

AEB-Danmil supplies a full line of filtering sheets and pressure filters of the highest quality.

Danmil range of filtering sheets:

DANMIL 100 / 110 / 130 / 140	
STERILIZING FILTRATION WITH REDUCTION OF MICROORGANISMS	
CHARACTERISTICS	APPLICATIONS
HIGH RATE OF MICROBIOLOGICAL RETENTION, POSSIBLE THANKS TO THE NARROW-PORED STRUCTURE OF THE FILTER MEDIA, COMBINED WITH AN ELECTROKINETIC POTENTIAL WITH ADSORPTION ACTION (CHARGED).	IN STERILE COLD BOTTLING, IN ORDER TO IMPROVE THE SHELF LIFE OF WINES, BEER AND JUICES. AS PRE-FILTERS UPSTREAM OF MEMBRANE FILTRATION, THANKS TO THE HIGH RETENTION CAPACITY OF COLLOIDAL COMPONENTS.
DANMIL 40 / 40 HF / 50 / 70 / 85 HF	
FILTRATION WITH REDUCTION OF MICROORGANISMS AND MICROFILTRATION	
CHARACTERISTICS	APPLICATIONS
THEY ALLOW TO REACH HIGH LEVELS OF CLARIFICATION FOR THEIR EFFECTIVE RETENTION CAPACITY OF THE FINEST PARTICLES AND MICROORGANISMS.	STORAGE AND BOTTLING OF MICROBIOLOGICALLY STABLE WINES.
DANMIL 06 / 09 / 12 HF / 15 / 20 HF / 30	
ROUGH, POLISHING FILTRATION	
CHARACTERISTICS	APPLICATIONS
THEY HAVE A HIGH VOLUME HOLLOW STRUCTURE AND A HIGH TURBIDITY ABSORPTION CAPACITY.	POLISHING OF THE PRODUCT, BE IT WINE, BEER, OIL OR JUICES.

Composition of AEB filtering sheets and Modules:

- Cellulose: gives electric charge, resistance and flexibility to the layer, allowing it to move and have a certain breaking capacity (if it was not there it would be like using a rigid cardboard that would break on first use).
- Diatomaceous earths: to close the pores and to make a sterilizing layer. Sheets with higher permeability have a lot of cellulose and little flour, while the tight ones are almost exclusively with DE with little cellulose. This is because the pore must tighten and get to a sterilizing micrometry to retain yeasts and bacteria.
- Perlite: to make the sheets more rigid and sturdy.
- Synthetic resins: sprayed on the filtering layer when it's almost complete. It's an additive that has the role of "binding" the mixture and also to give more positive electric charge to allow the sheet to stop colloids yeast and bacteria that normally have a negative charge.

The rougher side of the filter sheet is the one with the widest pores. Make sure to load the sheet with the rougher part facing the inlet of the wine. The rough face is the pre-filter to the smooth face.

Total volume of wine that can be filtered through a set of sheets:

Recommended flow (absolute number) times 8.

i.e.: 30 of the 40x40 rough filtering sheets:

140 x 30 x 8 = 336 HI or about 9,000 gallons.

Recommended flow for filtering sheets (any brand):

Rough filtering sheets: 1,000 l / m² / hr:

20x20 = 30 l / layer / hr

40x40 = 140 l / layer / hr

60x60 = 330 l / layer / hr

Sterilizing sheet: 500 l / m² / hr:

20x20 = 15 l / layer / hr

40x40 = 70 l / layer / hr

60x60 = 160 l / layer / hr

DANMIL SHEET	DANMIL DISC
DA 130	DA133
DA 110	DA113
DA 100	DA103
DA 70	DA73
DA 50	DA53
DA 40	DA43
DA 20 HF	DA23
DA 15	DA15
DA 09	DA09

With the same layers used to cut 40x40 and 60x60 sheets, AEB-Danmil also makes discs for lenticular filters. The above is a reference chart matching the porosity of the sheets with the lenticular filters discs.

Pre-coat and straight perlite for filtration

AEB offers a superior alternative to DE based filtration aids. For over 30 years we have pioneered a process that combines both scientifically and environmentally sound technology to develop Fibroxcel and Silite, a perlite based filtration aids. Currently, most of the filtration earths available in the market are based on Diatomaceous earth (which consists of fossilized remains of diatoms, a type of hard-shelled algae). On the contrary, Fibroxcel and Silite are based on perlite and integrated with charged fibers of cellulose and cotton. Perlite is a generic name for naturally occurring siliceous volcanic rock. A unique property of perlite is that it expands up to 20 times its original volume when it is heated to its softening range. This expansion process is caused by the presence of water in the crude rock. When perlite is rapidly heated to above 850°C (16,000°F), this water vaporizes and causes the softened rock to expand. Tiny glass-like bubbles are produced which account for the lightweight and exceptional physical properties of expanded perlite. These lightweight glass-like bubbles are then milled and classified under stringent quality control conditions to produce perlite filter aids. This material exhibits a unique, jagged, interlocking structure with myriads of microscopic channels

that guarantee optimum flow rates and clarities for a wide variety of applications. Perlite filter aids do not impart taste, color or odor to liquids being filtered and they are virtually insoluble in mineral and organic acids at all temperatures.

Advantages of perlite over DE and other filter aids: perlite based filter aids provide the user with a density advantage of 20% compared to DE, which is an important consideration when comparing costs and mass of material to dispose.

Perlite in Fibroxcel and Silite have a density of 5 to 7 lb/ft³, whereas the density of DE ranges from 11 to 15 lb/ft³. Experience in a variety of applications in many industries has shown that users of filter aids can substantially reduce filtration costs without sacrificing performance by converting to perlite filter aids. Finally, perlite is safer for the operator and much easier to dispose.

PRODUCT PERMEABILITY (DARCYES)	
FIBROXCEL 30	30
FIBROXCEL 10	65
SILITE MINI SPEED	29
SILITE NORMAL SPEED	69
SILITE HIGH SPEED	11
SILITE HIGH SPEED SP	65

Darcey values for AEB filtering earths

Fibroxcel 10: pre-coat with 10% fibers for gross filtration.

Permeability = 120 l (30 gallons)/m²/minute.

Dosage: 0.5-1 kg (1-2.2lb)/m² of filtering area for the formation of the pre-coat or in variable doses between 50 to 500 g/hl (4-40 lb/1,000 gallons) for the body feed filtration.

Fibroxcel 30: pre-coat with 30% fibers for polishing filtration.

Permeability = 50 l (13 gallons)/m²/minute.

Should be used in a variable dose between 0.8 and 1kg (1.7-2.2lb)/m² of filtering surface for building up the pre-coat, 20 and 80 g/hl (1.5-6 lb/1,000 gallons) for the body feed filtration.

Fibroxcel VAC: vacuum filters tend to have an extremely compact layer of earths that eventually breaks or plugs, Fibroxcel VAC mixed at 10% with the DE used for the filtration guarantees a smooth cut of the top layer and, thanks to its softening action, delays plugging of the cake and prevents cracks. The drum cut is linear and micrometric, with a noticeable increase in the total filtration capacity, with the result of a more satisfactory yield. The addition of Fibroxcel Vac makes it possible to treat very quickly suspensions loaded with hazy matter, which would require a great work to discharge coats, with the assurance of an excellent result. Fibroxcel Vac can also be used in conjunction with the body feed in pressure filters for particularly hazy musts and concentrates.

Silite mini speed: this is a very fine perlite, with low flow-speed, used for tight filtrations, especially the polishing ones.

Permeability l/m²/minute: 68-77, specific weight when wet: 0,21-0,23.

Applications: final filtrations of wines, vinegars, dry spirits, beer, oils, juices, distillates.

Silite normal speed: this perlite has a medium permeability and is recommended for all uncomplicated filtrations. It is used for normal filtrations.

Permeability l/m²/minute: 127-147, specific weight when wet: 0,20-0,22.

Applications: filtrations of wines, sweet spirits, distillates, fruit juices, syrups, beer, industrial drains, etc.

Silite high speed: the high permeability of this perlite, makes it ideal for filtering very hazy liquids with a high content of suspended solids. It is classified as a perlite for coarse filtrations.

Permeability l/m²/minute: 200-240, specific weight when wet: 0,16-0,18.

Applications: coarse filtrations of musts, worts, cloudy wines, thick spirits or syrups.

CHAPTER NINE

**Cleaners &
Detergents**



Water and time saving detergents for the winery

Removil & Removil K: are complex caustic detergents Na or K based. They are used to clean organic matters including tartrates. They do not require a citric rinse and they save a considerable amount of water in their application.

Remoxan: the active ingredient releases free radicals that will inactivate proteins and protoplasmic activities of the organisms present in the treated surface. The higher the pH of the washing solution, the better the free radicals are released. The Combination with Removil or Removil K, will optimize the oxidative power.

Use these products to conserve water and man hours to clean wine tanks, filters and anything that can stand a caustic wash.

In a side by side comparison of the Removil + Remoxan cleaning system to the traditional caustic cleaning, followed by a water rinse, then citric acid neutralization step, followed by a sterilizing step, the Removil detergent and Remoxan additive combination used significantly less water and man hours. Bioluminescence testing showed the tank to be clean and sterile. Wastewater discharge has been reduced by at least 50%. Man-hours to clean a tank have also been reduced by 50% or more (this translates into longer life for the tank washer as well).

Application:

- Prepare a 2% solution of Removil or Removal K in warm water (35°C-95°F)
- Add Remoxan 1:20 in respect to the quantity of Removil used (i.e. if 20kg of Removil was used, use 1 liter of Remoxan)

Simply rinse the tank until all the loose debris is out of the tank. Use the recommended levels of Removil detergent and Remoxan to do the tank cleaning. Remove the chemical solution. Rinse for 30-35 minutes or until the water discharge reaches winery water pH of 7.2.

Tank washing tips:

- Remove all large and loose debris from the tank with a quick water rinse before using cleaning solutions on debris that can be removed in this manner.
- Always empty the tank completely between cycles as some debris particles will float and tend to remain in the tank from cycle to cycle when the tank is not completely emptied.
- Use products in the recommended proportions.
- Dissolve all chemicals in a mix tub before adding to the body of water in the tank, to eliminate clumping of dry chemicals at the bottom of the tank.
- When reusing the solution, test the pH of the discharge solution before moving it to another tank. The desired pH is 13. Strengthen the solution if necessary to bring it back to the desired pH before starting on the subsequent tank.



- Test pH of rinse water to make sure you have returned to the pH of the winery water and that you are not using an unnecessary amount of rinse water.
- Strengthen the Remoxan every third tank.
- Do not reuse unusually dark colored solution or solution full of debris particles from a previous tank washing.

NEW! **Foam-KOH A & B:**

Foam-KOH A is a highly concentrated foaming detergent used in combination with Foam-KOH B to clean exterior tank surfaces. It's proprietary blend of builders, surfactants and other ingredients provide superior cleaning and economy. Removes common soil that builds up on tanks. Use Recommendation: Dilution rate will depend on application, soil type and water conditions. Can be applied with Hudson sprayer or foam generating equipment.

Light Duty Cleaning: 10:1

Medium Duty Cleaning: 8:1

Heavy Duty Cleaning: 5:1

Foam-KOH B is a highly concentrated, chlorine free, additive used in combination with Foam-KOH A to clean exterior tank surfaces. It's unique formulation blended with Foam-KOH A has a greater cleaning power, efficiency and soil removal. Removes common soil that can build up on tanks.

Use Recommendation:

Dilution rate will depend on application, soil type and water conditions.

Can be applied with Hudson sprayer or foam generating equipment.

Average dilution is 3oz per gallon



Foam-KOH A&B | **Before**



Foam-KOH A&B | **After**

CHAPTER TEN

Equipment



Ion Exchange, Stabymatic: a fully integrated ion exchange system used to reduce the pH and to stabilize wine or juice for tartrates. The stabilization works with the concept that subtracting K^+ from the media means lower formation of K -tartrate crystals. Furthermore higher H^+ means lower pH. To stabilize a full tank most of the time only 20-30% of the wine needs to be treated, lowering the total pH by an average of 0.3, and eliminating tartaric instability. Older style ion exchange units, were plagued by issues relating to high water use, high effluent production, wine quality issues (taints, color, off-characters and oxidation),

mobility and problems with blocking resin columns resulting in significant loss of efficiency, product volume and quality. Also, in many cases, the old fashioned columns cannot handle must. AEB has addressed and eliminated all of the above problems in the development of the Stabymatic. For musts, a maximum turbidity of 600 NTU's is acceptable, as long as the solids have a diameter of less than 0.4 mm.

Stabymatic Sizes Processing speed per hour Electricity Needed:

- 25 65gal/h Air only
- 200 528gal/h 480V Three Phase
- 1000 2600gal/h 480V Three Phase
- 2000 5200gal/h 480V Three Phase



Reactiveur: automatic yeast rehydration and acclimation

When rehydrating ADY (active dry yeast), a few simple things can make a huge difference in the quality of the biomass that ultimately is going to ferment the must. Temperatures, timings, aeration and acclimation are all variables that can influence the success of yeast rehydration. The yeast Reactiveur engineered by AEB has the capability to optimize this delicate process, guaranteeing the best out of the inoculum used.

After the operator sets the amount of yeast to rehydrate, the machine starts by intaking a proportional amount of water. Then the water is brought to the programmed temperature and maintained warm, waiting for the operator to add the yeast. Water and yeast are constantly homogenized and saturated with oxygen through continuous mixing. Acclimation is then achieved by introducing must at small increments, with intervals programmed in the settings. After the acclimation is finished the machine can pump the active inoculum into the must tank.

Reactiveur sizes, tank volume and electricity Needed:

- 3-10 Kg of yeast, 85 gallons, 480V Three Phase
- 10-30 Kg of yeast, 237 gallons, 480V Three Phase
- 30-60 Kg of yeast, 528 gallons, 480V Three Phase
- 60 Kg of yeast, 792 gallons, 480V Three Phase



E-Flot: for batch must flotation.

Flotation is an alternative, intelligent method for achieving must clarity, by pushing solids against gravity and collecting them in a “cake” at the top of the tank. The clear juice is then racked and separated from the racking valve. AEB manufactures the E-Flot, a state of the art batch flotation system, to get the job done quickly and economically. The clarification of must using the E-Flot is achieved through the incorporation of an inert gas (Nitrogen) into the solids that make up the turbidity of the liquid. Gelatin products like Gelsol or vegetable derived proteins like Ve-gel, may also be incor-

porated by the machine to optimize the process. The gas combines particles in suspension and makes them float towards the surface of the tank leaving a clear must at the bottom. It is important to first make sure that the must is thoroughly depectinized. AEB recommends the use of enzymes such as Endozym Flotation, Ice, Micro or Endozym ICS 10 Eclair to help achieve depectinization. In order to have optimal results and better must clarity, it is recommended to use a specific gelatin, like Gelsol, that allows the formation of a good sized flocculate that will encompass all the particles that are to be eliminated.

The benefits of the floatation machine are numerous:

- Saving on power and eliminating the refrigeration and subsequent warm-up time, when switching from traditional processing by cold settling.
- Time and tank saving: 50 tons of fruit at 9 am can, in theory, be inoculated by 4 pm on the same day using floatation clarification. This compares to a minimum 24 hrs settling time plus racking, warming, and RDV filtration time.
- The capital cost of a floatation machine is less than one tenth of a similar rated centrifuge.
- E-Flot is a versatile machine that allows operation at a higher flow rate for gross fining or slower rate for a brighter must.

How to perform a pectin test

We know that if flotation is unsuccessful the cause most times has to be found in the must, not in the equipment. Check if the must is too cold (less than 50 F or 10 C), if the must is fermenting, or if the enzyme did not work (didn't hydrolyze the pectins). In order to check if the enzyme has worked we can ask to the lab to run a pectin test:

- Add 10 ml of ethanol to 5 ml of centrifuged must/wine.
- Let it sit for 60 seconds.
- If floccules appear after one minute, pectins are still present in the wine and they might cause problems with settling.

Most times the test performed this way will give results that are practical enough to understand if the must is de-pectinized. A more accurate procedure requires the ethanol used in the reaction to be acidified. To prepare the "acidified ethanol" solution, pour 250 ml of alcohol into a flask. Add 2.5 ml of hydrochloridric acid to the alcohol and mix gently.

E-Flot Sizes Processing speed per hour Electricity Needed:

E-Flot 5: 1,320 gallons, 220V Three Phase

E-Flot 25: 6,600 gallons, 480V Three Phase

E-Flot 50: 13,200 gallons, 480V Three Phase

E-Flot 80: 21,133 gallons, 480V Three Phase

E-Flot 130: 34,300 gallons, 480V Three Phase



NEW!

Dissolving unit: equipment to solubilize chemicals and powders in general like: Tartaric acid, gelatin, tannins, Bentonite, etc. The system is equipped with a mechanical powders dissolver, realized with the aid of the head of a vertical axis centrifugal pump and a conical powder containment hopper, also with vertical axis. The liquid suction point remains separate from the powder suction point, so as to exclude a reaction between the two, up to the point of contact exactly in the centre of the impeller. This is made possible by a double suction chamber, which together with the action of the liquid on the impeller, generates a Venturi effect

on the powders. The high speed together with the friction of the liquid with the powders guarantees the best effect of prompt dissolution. The powders can be dosed with a shutoff valve located on the terminal of the conical hopper. The same valve is used to adjust the powder dissolving speed.

- **Time saving:** the rate of slurry for Tartaric acid is about 25 kg every 30 seconds, plus some time in recirculation. With Benotnite the time is just a little more and requires slightly more recirculation.
- **Safer work environment:** reduces the exposure of the operators to the dusts deriving from the operations of pouring the bags of the commercial packages
- **Quality:** this system avoids contact with the air and in particular greatly reduces incorporation of Oxygen into the solution, since it does not use the classic agitator with marine propeller.
- **Precision:** the fully accessorized model includes a PLC where the operator can decide a memorized recipe in order to standardize the concentration of certain slurries.
- **Modular:** Can be integrated with a dosing pump that can dose proportionally to the flow of a wine being transferred or sent to bottling.

DeOX : a system to manage gasses (O₂ and CO₂) in wines proportionally to the flow on the way to the fillers.

NEW! **Removing O₂**

Removing oxygen in wines before bottling guarantees the duration of the product over time and allows working with lower free sulfur dioxide.



After the operator sets the desired level of residual oxygen, the DeOx begins to let the wine enter and takes measurements of dissolved Oxygen through a first Hamilton probe. The stripping of Oxygen is then done through the release of Nitrogen in the piping. This system differentiates from a standard sparger, because the machine is continuously measuring the instantaneous flow rate and calculates the exact quantity of Nitrogen to be dispensed through a mass sensor. This way it precisely diffuses the quantity of gas in a porous cylinder. As the process continues, the machine calibrates itself depending on how the stripping is working.

The wine enters the stripping tank and releases the N₂ rich in O₂. The wine with low O₂ content is again analyzed with a second Hamilton O₂ sensor that controls the achievement of the desired set point and perfects the dosage, also guaranteeing the auto calibration.

Dosing CO₂

DeOx is capable of adding CO₂ up to 11 g/l. After the operator sets the dosage of carbon dioxide to be added, the equipment begins to let the product enter the DeOx. The characteristics of pressure and temperature of the wine are measured and, together with the CO₂ value already present, they contribute to the calculation of the exact quantity of gas to be dosed. The injection is carried out by an appropriate number of mass flow controllers, depending on the flow rate of the line and the maximum concentration of CO₂ desired.

The presence of a stabilizing pressure buffer tank, guarantees the product to the filler without free gas. At the output of the DeOx system there is a CO₂ analyzer that

controls the product according to the level set in the system. This in-line analysis is practically continuous and allows also to perfect the dosage and to self-calibrate the machine. The continuous control of the pressures, detected at critical points, makes it possible to harmonize the system with the feed pump and the isobaric filler. DeOx resists any thermal and chemical stress, for perfect cleaning and sanitization. The dosage can be done between 0.5 and 11 g/L of CO₂.

DeOx systems are built custom for each client, but will normally feature:

- A dedicated washing line, with rotary spray heads inside the pressurization tank.
- Connection to any CIP system or simply washed according to the normal cellar procedures.
- Will work at any temperature, guaranteeing the same precision even on products at temperatures up to 20°C.

DEOX equipment can be customized according to customer needs.

Dosing pumps:

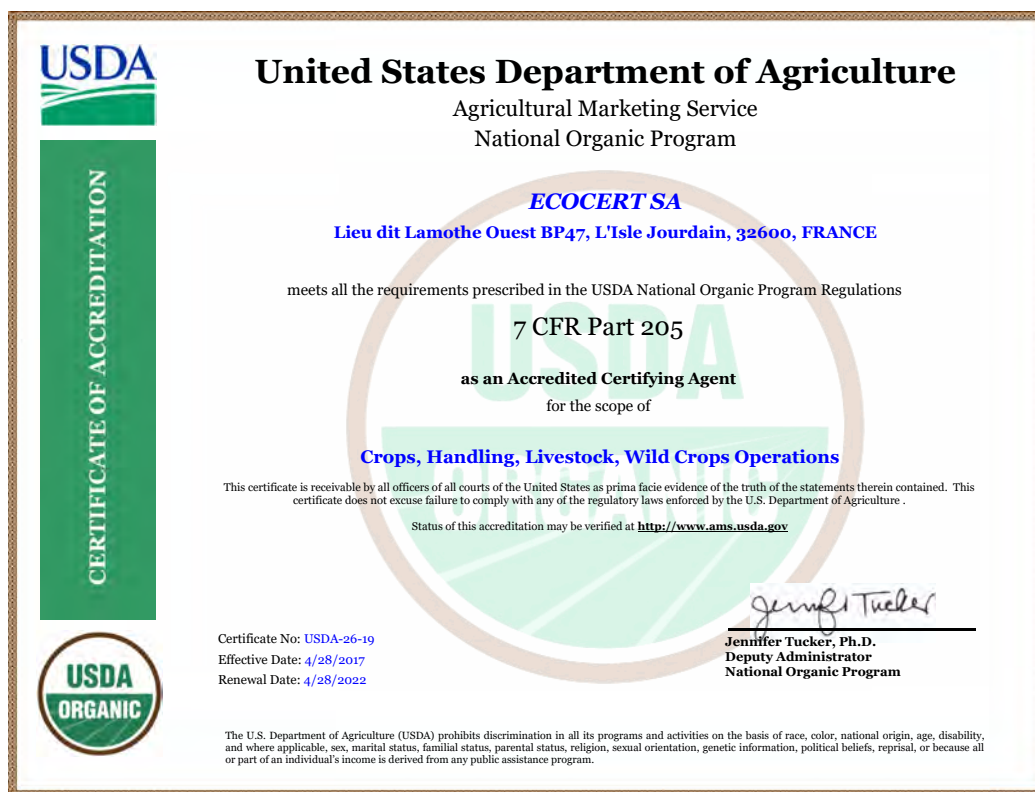
Proportional dosing of liquid products on the way to packaging.

- Can be used to dose any products like acids, concentrated must, SO₂, in line to bottling fillers.
- It can be paired with a scale system to always double-check accuracy.
- Can be used to dose products like gum Arabic after the filter (picture).
- Can be paired with a dissolving unit for dosing powders.



CHAPTER ELEVEN

Appendix



Organic Winemaking

Organic wine consumption is still relatively small: about 3.6% worldwide. But it's estimated that it will reach 1 billion bottles by 2022. It was 350 millions in 2012 and 650 in 2017. Italy, France and Spain combined make about 80% of the Organic wine. In France at the end of 2017 over 10% of the vineyards were either certified organic or in conversion.

In France AEB has its organic pole, and this is where most of our products are certified by the local agency Ecocert, officially recognized by the USA NOP program.

Organic certified products:

Primaflora® Vb Bio & Primaflora Vr Bio

Developed at the AEB R&D lab of Colmar in Alsace back in 2010 and improved over the years in collaboration with the University of Dijon; this technology is based on add-

ing non-Saccharomyces yeast to grapes, in order to establish a biodynamic equilibrium that pushes out undesired contaminants by colonizing the media and consuming the dissolved oxygen. It actively depletes the must from Lactobacillus, Brettanomyces and other contaminants. Primaflora is based on Metschnikowia pulcherrima non-Saccharomyces yeast. Among the characteristics of this strain there is a strong anti-Brettanomyces activity due to the fact that the pulcherrimic acid produced depletes the media from iron, creating unfavorable conditions for Brett (Oro et al., 2014).

Levulia Probios

Organic dry yeast selected in the Champagne region, for the vinification of fine and elegant wines. Levulia Probios is a 100% organic yeast. Its resistance to extreme conditions of pH, temperature and alcohol, makes it a yeast of reference for still wines and for the prise de mousse of sparklings. It allows to secure the fermentation, with total consumption of sugars and very low production of unwanted by-products, as volatile acidity, pyruvic acid and SO₂.

Levulia Probios is very respectful of the wine variety, and equally suitable both for aromatic whites, rosé and young red wines. Its resistance to SO₂ and its ability to plant itself quickly also in environments with an existing flora, makes it ideal for restarting stuck fermentations. The addition in maceration guarantees the correct course of pre-fermentative macerations, thus avoiding unwanted organoleptic deviations.

Levulia Torula

Organic, non-saccharomyces. yeast for varietal aromas enhancing.

Levulia Torula is a yeast strain belonging to the species *Torulasporea delbrueckii*, isolated in Burgundy, in collaboration with the University of Vine and Wine (UVV) of Dijon. *Torulasporea delbrueckii* is a strain for alcoholic pre-fermentation, normally naturally present in the native flora of the must. It contributes positively to the organoleptic complexity of the wine while limiting the production of volatile acidity (Quoc Phong Lai, 2010). Levulia Torula is used in sequential inoculation, 24 to 48 hours before the classical strain of *Saccharomyces cerevisiae*. Its rapid establishment in the must makes it an ideal tool to limit the spontaneous development of other strains of unwanted native yeasts.

After the development of *Saccharomyces cerevisiae*, the population of *Torulasporea delbrueckii* will die down and rapidly begin its autolysis during alcoholic fermentation. It will then contribute supplying nutrients and to the detoxification of the medium. It will also contribute to reduce the sensations of astringency in the mouth through the release of polysaccharides.

Levulia Torula is suitable for all types of grape varieties, terpenic and/thiolated (Sauvignon Blanc, Chardonnay, Gewurztraminer, Colombard, Riesling, Muscat, Sémillon ...).



Levulia Pulcherrima

Organic, non-sacch. yeast for varietal aromas enhancing.

Recommended for the fermentation of aromatic, complex, big and fruity whites or rosé wines. *Levulia Pulcherrima* belongs to the specie *Metschnikowia pulcherrima*, a microorganism naturally occurring on the grape skin. It contributes, from the pre-fermentation phase, to get extra complexity, enhancing the organoleptic characteristics and varietal aromas. In this important phase, it also competes with microorganisms like *Brettanomyces* and *Lactobacillus*, regulating the flora without need of sulphur additions. Enzymatic activities, contributing to the aromatic complexity, associated with *Metschnikowia pulcherrima* are:

- Activity Cys- β -Liasis: release of thiols (Zott, 2009)
- Activity β -glicosidasi: release of terpenes (Günata et al, 1990)
- Aspartate protease activity: release of peptides or amino acids (Theron et al., 2017).



Levulia Alcomeno

Organic, non-sacch. yeast for low alcohol conversion and lactic acid production.

Recommended for wines in need of more equilibrium between acidity and alcohol.

Levulia Alcomeno is a non-*Saccharomyces* strain belonging to the specie *Lachancea thermotolerant* (ex *Kluyveromyces thermotolerant*).

It carries out the lactic fermentation from sugars and allows bringing wine freshness and balance to the mouth. The result is a high increase of total acidity and a decrease of the alcohol content. It works with sequential inoculation and can ensure the alcoholic fermentation at least up to 7%.

 **Auxilia:**

Yeast nutrient based on yeast derivatives.

Auxilia is the ideal fermentation bio-regulator, for the production all organic wines. It Improves fermentation bringing a contribution in amino acids and FAN. The yeast hulls present in the formulation will contribute to decrease the onset of volatile acidity. It also improves the fermentability of the bases sparkling wine by absorbing fermentation inhibitors. Auxilia is neutral from the point of view of taste, but improves maturation on lees.

There are four main labeling categories for certified organic wine in the USA.

Two are the most relevant:

- Organic wine: made with at least 95% organic ingredients.
- Wine made with organic grapes: made with at least 70% organic ingredients.

Non-Organic ingredients involved in the processing of these two categories must be in accordance with 7 CFR 205.605-606 (Nonagricultural and non organically produced agricultural products allowed as ingredients in processed products labeled as “organic” or “made with organic”).

What follows is a list of AEB products submitted to CCOF for review with the classification.

Enzymes

Endozym line: USDA NOP Allowed.

Malolactic Bacteria

Biolact One Fresh: USDA NOP allowed.

Tannins

Fermotan, Gallovin, Protan Pepin, Protan Raisin, Taniblanc: USDA NOP restricted - CCOF reviewed: for use only in products labeled “made with organic grapes”.

Processing aids

Fibroxcel10, 30 and Vac: USDA NOP allowed.

Yeast and yeast derived products

USDA NOP restricted - CCOF reviewed: when used as food or a fermentation agent in products labeled "organic," yeast must be organic if its end use is for human consumption; nonorganic yeast may be used when organic yeast is not commercially available.

- Yeast: Fermol Arome Plus, Fermol Chardonnay, Fermol Blanc, Fermol Mediterranee, Fermol PB 2033, Fermol Sauvignon, Fermol Super 16, Fermol Premier Cru, Glutaferm ONE
- Yeast nutrients: Fermoplus DAP Free, Fermoplus Tropical
- Yeast polysaccharides: Batonnage Elevage, Batonnage Plus Texture

How to reduce pesticides

	CONTROL	DECORAN GRAN 40 G/HL + CATALASI VEGA 40 G/HL	DECORAN 40 G/HL + PYROFF 40 G/HL	CHITOCCEL
BOSCALID	0,011	ND	ND	ND
DIMETHOATE	0,006	ND	ND	-100%
DIMETOMORF	0,034	ND	ND	-23,5
METALAXIL	0,048	-58,3%	-64%	0%
FOSETYL-AL (ETHYL HYDROGEN PHOSPHONATE)	0,029	-20,7%	-10,3%	-17,2%
FOSETYL-AL (SUM OF FOSETYL+ PHOSPHONIC ACID+OTHER SALTS EXPRESSED AS FOSETIL)	2,36	-21,2%	-10,2%	-3,4%

Test on fining of different pesticides

Boscalid: anti-Botrytis acts against Ascomycetes and Deuteromycetes class (Botrytis cinerea, Alternaria spp. and Stemphylium vesicarium). It inhibits the spores germination, it stops the respiration process. At biochemist level it acts stopping the availability of energy sources.

Metalaxil anti-downy mildew: is a fungicides whose active ingredient is effective against different phytopathogenic Oomycetes.

Dimethoate: is an insecticide that belongs to phosphorganic class; it is a contact product against different phytophagous insects groups.

Dimetomorf : against fungi, is a cinnamic acid derivative. Its activity is especially elevated at the beninning of the infection, when the sporulation happens.

Fosetil aluminium (Aliette, Ethylphosphito of aluminium, Fosetil-aluminium, Phosethyl-Al) is a fungicidal. It rapidly penetrates through vegetal tissues doing a biological protection on the plants stimulating the formation of natural defence substances (phenols and phytoalexins).

- The product releases phosphorous acid, for that reason the legislation defines the Fosetil residual as the sum of Fosetil and phosphorous acid.
- In reality, the phosphorous acid can derives from different sources, as Potassium Phosphonate, Potassium Phosphytes, (classified as fertilizers) and also from derivatives of seaweeds usable in organic agriculture too.

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'll 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 powder (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 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).

PRODUCT DILUTED 10 TIMES	1LB 1,000 GALLONS	10 GRAMS/HL	DENSITY OF PURE PRODUCT AT 20 °C
ARABINOL	1.1 ML IN 1 LITER	0.91 ML IN 1 LITER	1.1 +/- 0.05
ARABINOL AROME	1.1 ML IN 1 LITER	0.91 ML IN 1 LITER	1.1 +/- 0.05
ARABINOL HC	1.0 ML IN 1 LITER	0.87 ML IN 1 LITER	1.15 +/- 0.05
ARABINOL SUPER ROUGE	1.1 ML IN 1 LITER	0.91 ML IN 1 LITER	1.1 +/- 0.05
CARBOSIL	1.0 ML IN 1 LITER	0.83 ML IN 1 LITER	1.2 +/- 0.05
GELSOL	1.0 ML IN 1 LITER	0.83 ML IN 1 LITER	1.2 +/- 0.05
LIQUID TANNINS	1.0 ML IN 1 LITER	0.83 ML IN 1 LITER	1.2 +/- 0.05
SPINDASOL	1.0 ML IN 1 LITER	0.83 ML IN 1 LITER	1.2 +/- 0.05

Densities of liquid products and cheat sheet for additions.

How to avoid pinking

Pinking is caused by the oxydation of leucoanthocyanidins (not colored) to a cyanidin (colored). Reductive conditions throughout vinification and aging prevent the occurrence of the phenomena.

Higher dosages of clarifying agents such as gelatin, pea and potato proteins (more in general all those agents acting on phenol compounds) might reduce the overall amount of leucoanthocyanins.

As Pinking cannot be predicted prior occurrence, antioxidant compounds should be used as a safeguard against the oxidation of the precursors and the consequent emergence of the pink color.

- 1.** Maintain the reductive state of grapes: at arrival use 10-60 g/hL or 100 kg of grapes of Gallovin
- 2.** Optimization of clarification: During clarification add 15-100 g/hL of Catalasi AF Plus
- 3.** Maintain the reductive state of wine during storage:
 - Elevage Glu 20g/hL
 - Gallovin 5-20 g/hL

How to ameliorate smoke taint during winemaking

Over the past two decades, wildfires have increasingly exposed vineyards and grapes across the world to smoke. Smoke taint (undesirable sensory characters, such as smoky, burnt, ashy or medicinal) is caused by volatile phenols compounds, which can be present in the must in their free form or bounded to form glycosides. During fermentation (and over time in barrel or bottle) these glycosides can break apart, releasing the volatile phenols into the must or wine, increasing the perception of smoky flavor. Several

techniques and products can be employed in the winery to minimize the sensory impact of undesirable smoke-derived aromas, flavors and compounds in wine.

1. Minimize contact with the skins

- Hand pick fruit, exclude leaf material, maintain integrity of harvested fruit, keep fruit cool (50 °F), whole bunch press and separate press fractions, minimize fermentation time on skins.

2. Increase wine complexity using aromatic yeast

- Fermol Arome Plus, Fermol Red Fruit, Fermol PB2023.
- Increase yeast aromas productions: Fermoplus DAP FREE, Fermoplus Tropical, Fermoplus Floral. 2-4 pounds/1000 gallons at the beginning of fermentation

3. Consider addition of tannins to balance the shortened skin contact

- Tanéthyl Effe to stabilize the color from the beginning
- Protan Peel to add skin tannins
- Ellagitan Fruit Reserve to reduce intensity of smoke characteristics through increased wine complexity.

4. Conduct trials with fining agents

- Antibrett
- Decoran Gran

These techniques may help reduce the extraction and expression of smoke taint compounds, but they are unlikely to eliminate the problem completely: therefore, we recommend to market for quick sale to avoid smoke-related characteristics in bottle as wine ages.

**“Let’s forget about the books for now,
and have a glass of wine...”**

- Louis Pasteur

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