



WINEMAKING HANDBOOK

VOLUME 16



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For the people thinking this manual includes the use of chemicals to “doctor” wine—let’s reconsider...

No matter where we turn these days it seems we are bombarded with false and misleading statements about practices and products that are supposedly better for our health and the environment. More than ever, we need to be aware of greenwashing and recognize the clear fact that electric cars, reusable bags, or water bottles will not save us as much as changing our lifestyle and reducing what we consume every day. Pushing practices and products towards this green trend is not always what’s best for the final product as is the case with “natural wines”.

At AEB we strive to facilitate a process of winemaking under the careful control of technicians using quality products, such as the ones listed in this catalog, to produce a wine made with the fruit of the vineyard developed in the best possible way. Natu-

rally derived ingredients ferment and refine such as selected natural yeast strains, animal and plant derived proteins (i.e. gelatin, casein, pea proteins etc.), oak tannins from natural wood, and mined minerals such as bentonite. While “natural” wine advocates have labeled these products as “chemicals”, to promote their own alternatives, the only real variation is that these items are not used in their wines. Overall, “natural” wine making practices are not any better as they are not regulated but rather a set of well intentioned, voluntary production practices. In contrast, AEB ingredients must adhere to a clear and regulated set of federal requirements and can be used in “Certified Organic” wines and labeled as such.

Ochratoxin A (OTA) is another compound that is known to be harmful to human health. It can be caused by a spontaneous microorganism native to grapes that is one of the major mycotoxins classified as potentially carcinogenic to humans. For human consumption, wine is one of its main substrates. The main producer of this toxin is *Aspergillus carbonarius*, a fungus that contaminates grapes early in the growing season. The vinification process reduces the toxin content in wine compared to the grapes. However, not all the vinification steps contribute equally to this reduction. During the maceration phase in red wines, toxin concentrations generally tend to increase. Only certain physical, chemical, and microbiological post-harvest strategies are useful in reducing OTA levels in wine. Among these, is the use of fining agents, such as gelatin, egg albumin, and bentonite.

While Mother Nature may have given us grapes to eat, drink juice or make vinegar, it is the winemaker that can redirect the process into making a good wine. AEB has been partnering with winemakers and providing the tools to help this happen since 1963 and will continue to do so today and for many years to come!

The background of the entire page is a highly detailed and vibrant illustration of a greenhouse. The scene is filled with a variety of fruits and flowers. In the foreground, there are large, realistic-looking flowers, including white daisies, pink roses, and yellow cosmos. Interspersed among the flowers are various fruits: red apples, yellow lemons, purple grapes, and clusters of raspberries. The greenhouse structure is visible in the background, with metal frames and glass panels. The overall atmosphere is bright and lush, with a sense of abundance and natural beauty.

CHAPTER 1

AEB YEAST

Selected in nature to respect and enhance the varietal characteristics of the grapes

The use of selected yeast in winemaking dates back centuries. However, the exact individual or culture credited with being the first to intentionally select and use specific yeast strains for fermentation is not known.

Throughout history, winemakers have observed and capitalized on the natural fermentation process, often unknowingly by selecting yeast strains through traditional practices with grape skins for winemaking purposes. Significant attention and advancement in the mid-19th century came with the pioneering work of Louis Pasteur.

Pasteur published his seminal paper “Mémoire sur la fermentation alcoolique” (“Memoir on Alcoholic Fermentation”), in which he discussed his experiments in demonstrating the vital role of yeast in alcoholic fermentation. His discoveries further provided a scientific basis for the intentional selection and use of yeast strains in winemaking.

Since then, winemakers and researchers worldwide have continued refining and innovating yeast selection techniques, developing a wide range of specialized yeast strains tailored to specific wine styles, flavors, and fermentation conditions.

Today, using selected yeast is a standard practice in modern winemaking, contributing to consistency, quality, and flavor enhancement in wines produced globally.

YEAST	RECOMMENDED VARIETIES	IDEAL ALCOHOL	POF FACTOR	COPPER RESISTANCE
Fermol Arôme Plus	Pinot Grigio, Moscato, Sauvignon Blanc, Riesling	14.5	Negative	Excellent
Fermol Blanc	Chenin Blanc, Sparkling base, French Colombard, Fruit Wines	15.5	Negative	Excellent
Fermol Chardonnay	Chardonnay, Viognier, Grillo, Chenin Blanc, Semillon, Marsanne	15.5	Negative	Medium
Fermol Charmat	Prise de Mousse, Hard Seltzers	15.5	Negative	Excellent
Fermol Complete Killer Fru	Normally used to restart stuck fermentations	14.5	Variable	Excellent
Fermol Cryofruit	Gamay, Syrah, Riesling, Traminer	14.5	Negative	Very High
Fermol Fleur	Grüner, Chenin, Pinot Grigio, Riesling	15	N/A	Excellent
Fermol Grand Rouge	Bordeaux Varieties, Sangiovese, Malbec, Tempranillo, Norton	15.5	Weakly positive	Excellent
Fermol Lime	Pinot Grigio, Sauvignon Blanc, Chardonnay, Grüner	14	N/A	Excellent
Fermol Méditerranée	Bordeaux Varieties, Pinot Noir, Zin, Malbec, Barbera	14.5	Negative	Excellent
Fermol Perle	For the primary and secondary fermentation of Prosecco style wines	14.5	Negative	Excellent
Fermol PB2033	Fruity and colored Rosé, Noveau wines	14.5	Negative	Medium
Fermol PMD53	Sauvignon Blanc, Riesling, Traminer, Vermentino, Falanghina	14	Variable	Excellent
Fermol Premier Cru	Bordeaux Varieties, Sangiovese, Nebbiolo, Tannat, Malbec	14.5	Variable	Excellent
Fermol Red Bouquet	Rich Rosé wines, Syrah, Mourvèdre, Sangiovese, Petite Sirah	15.5	Negative	Medium
Fermol Red Fruit	Pinot Noir, Petite Sirah, Gamay, Grenache	15.5	Negative	Excellent
Fermol Rouge	Sangiovese, Dolcetto, Merlot, Grenache	15	Negative	Excellent
Fermol Super 16	Cabernet Sauvignon, Zinfandel, Primitivo, Passito style reds and whites. Ice wine	16	Negative	Excellent
Fermol Sauvignon	Sauvignon Blanc, Viognier, Verdelho, Traminer, Tocai, Garganega	15	Negative	Excellent
Fermol Tropical	Fumé Blanc, Chardonnay, Marsanne, Viognier, Müller Thurgau, Grillo	15	N/A	Excellent
Levulia T.P.CO	Cabernet Sauvignon, Cabernet Franc, Merlot, Syrah, Petite Verdot	16	Negative	Excellent

VA PRODUCTION	NUTRITIONAL NEEDS	FERMENTATION SPEED	SO ₂ PRODUCTION	GLYCEROL PRODUCTION	H ₂ S PRODUCTION
Low	High	High	Average	Average	Average
Very Low	Very Low	High	Average	Average	Average
Very Low	Average	Medium	Average	High	Average
Average	Average	Medium/High	Medium/High	Medium/High	Average
Average	Average	Medium	Low	Average	Low
Very Low	Low	Medium	Low	Average	Low
Low	Average	Medium/High	Low	Average	Average
Medium/Low	Average	Medium/High	Low	Medium	Average
Low	Medium/High	Medium/High	Low	Low	Average
Low	Low	Medium/High	Low	High	Average
Average	Medium/Low	Medium/High	Average	High	Average
Medium/Low	Average	Medium/High	Medium/High	Average	Average
Low	Low	Medium/High	Average	Average	Average
Low	Average	Medium/High	Low	Average	Average
Low	Medium/Low	Medium/High	Average	High	Low
Very Low	Low	Medium/High	Low	Average	Average
Low	Average	High	Low	Average	Average
Low	Average	High	Low	Average	Average
Very Low	Low	Medium	Average	Medium/High	Low
Low	Average	Medium/High	Low	Average	Average
Low	Low	High	Average	High	Low

Fermol Arôme Plus

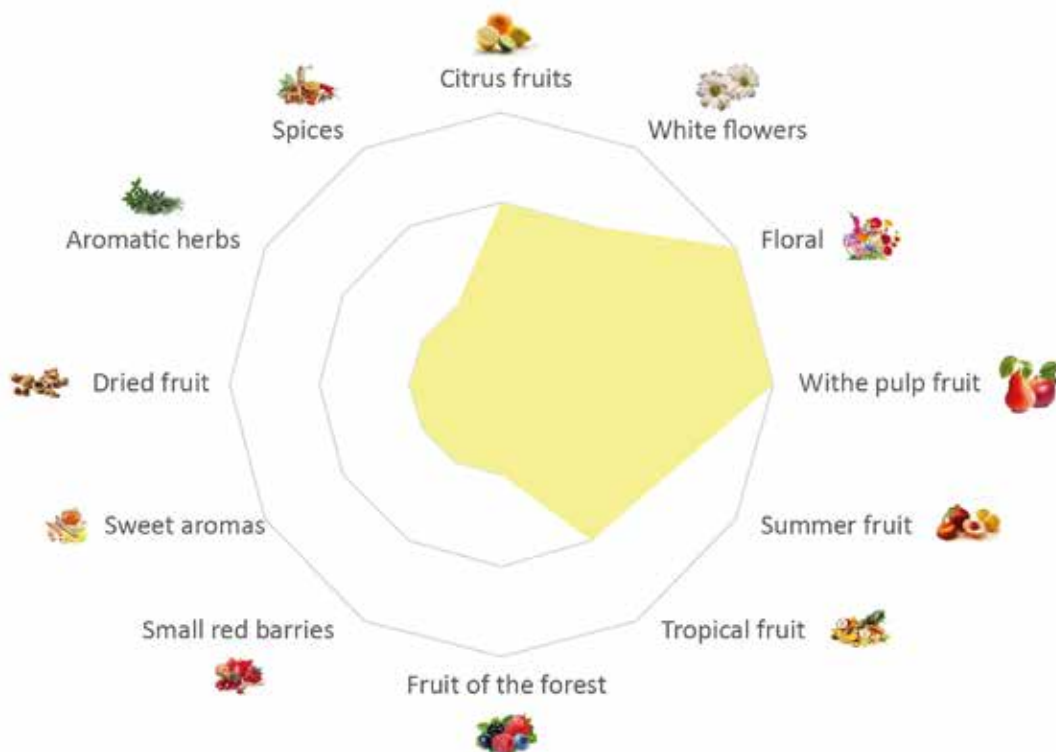
Fermol Arôme Plus produces wines with very intense aromas in which the primary varietal notes of the fruit, blend harmoniously with the secondary aromas produced by the fermentation.

Fermol Arôme Plus enhances floral notes, boosts terpenes optimizing the aromatic expression of the varietal. It is characterized by a good ethanol tolerance, resistance to sulfur dioxide and can start fermentation at very low temperatures (12°C/53°F) with a short lag-phase.

Fermol Arôme Plus is recommended for Pinot Grigio, Moscato and performs particularly well in co-fermentation with Fermol Chardonnay for modern and round aromatic whites. When using this strain, be aware of the high YAN demand. It is killer factor neutral and POF negative, therefore it does not produce volatile phenols



Available: 500 grams and 10 Kg bags



Graph: Fermol Arôme Plus

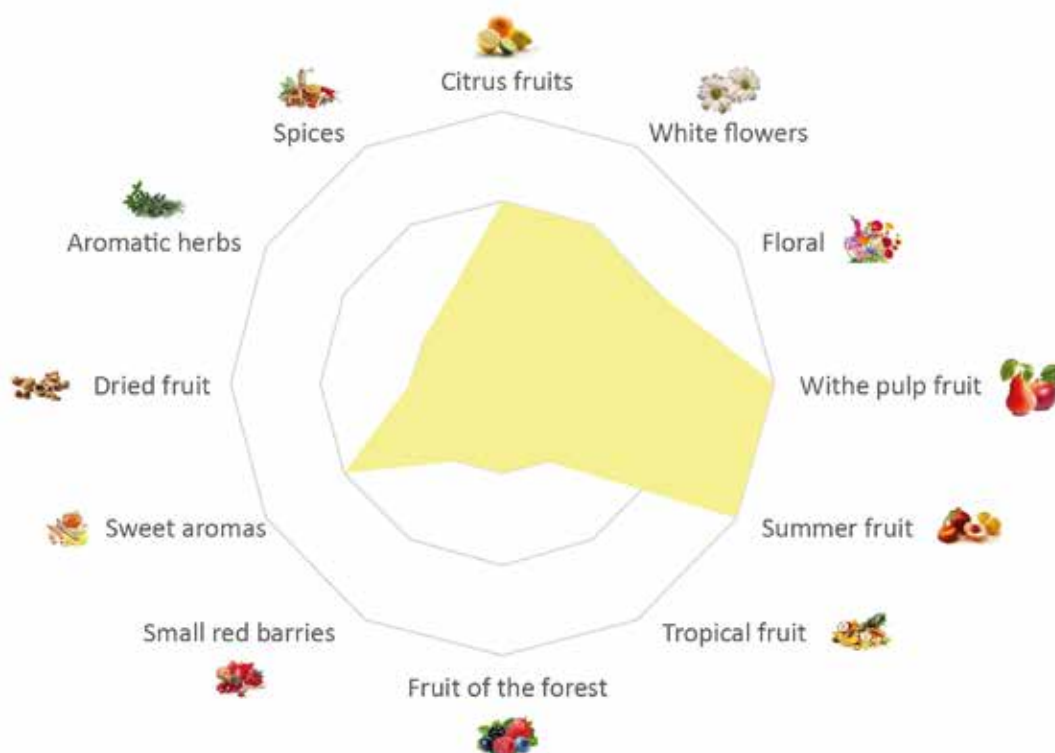
Fermol Blanc

Fermol Blanc is a low-maintenance “bayanus” yeast, with a very low nitrogen requirement. This strain develops well even at low temperatures. It does not produce hydrogen sulfide, except in cases of extreme lack of nutrients. Therefore, this strain is particularly recommended for maturation on the lees.

Wines made with Fermol Blanc are full-bodied with very complex aromas that depending on the cultivar, are reminiscent of flowers, citrus, or white-pulped fruit.

It is resistant to adverse conditions like low nutrition, cold temperatures, or high alcohol. This makes the strain also ideal for cider, fruit wines, and mead. Killer factor neutral.

Available: 500 grams and 10 Kg bags



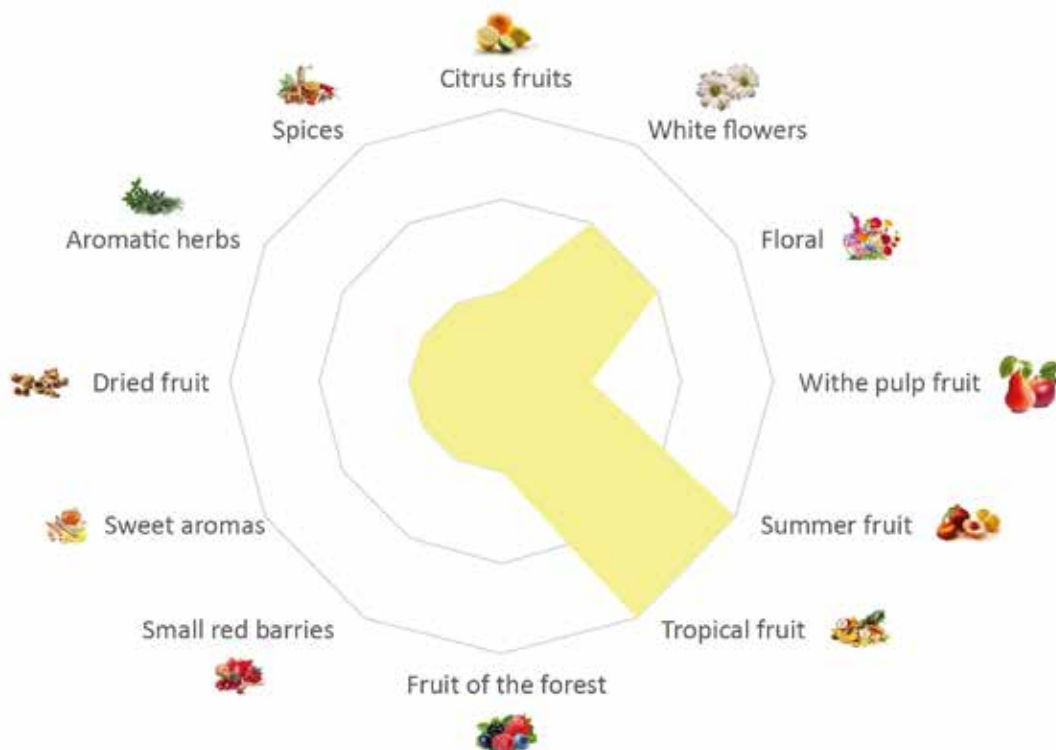
Graph: Fermol Blanc

Fermol Chardonnay

Fermol Chardonnay highlights the natural nuances of ripe and exotic fruits. Thanks to its high production of mannoproteins it produces wines with a full and smooth mid-palate. Being especially cryophilic, Fermol Chardonnay is particularly suitable to ferment white musts by cold maceration or fruit processed at low temperatures.

The aromatic intensity already high during fermentation, develops substantially more during the refining and maturation stage. Because of its nature, this strain originates very fine lees that immediately release polysaccharides into the media. This contributes to 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: 500 grams and 10 Kg bags



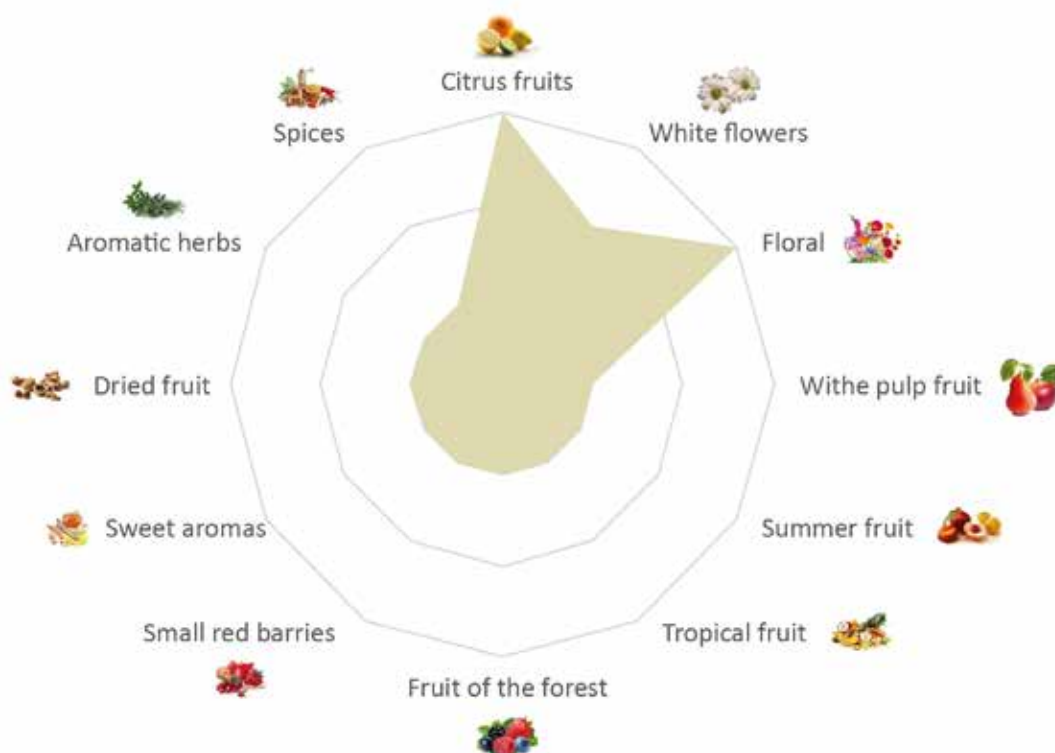
Graph: Fermol Chardonnay

Fermol Charmat

Fermol Charmat was originally developed for refermentations in pressurized tanks. Over the years, it has been used for many difficult fermentations including for hard seltzers and ciders where nutrition is often not adequately balanced.

It has an exceptionally high fermentation rate that accentuates white fruit and citrus notes in white wines, and does not cover the varietal aroma. Low nutritional requirements, high alcohol tolerance, and strong cryophilic attributes make Fermol Charmat particularly suitable for Charmat or Champenoise methods. Excellent results have also been obtained in restarting stuck fermentations. Killer factor neutral.

Available: 500 grams and 10 Kg bags



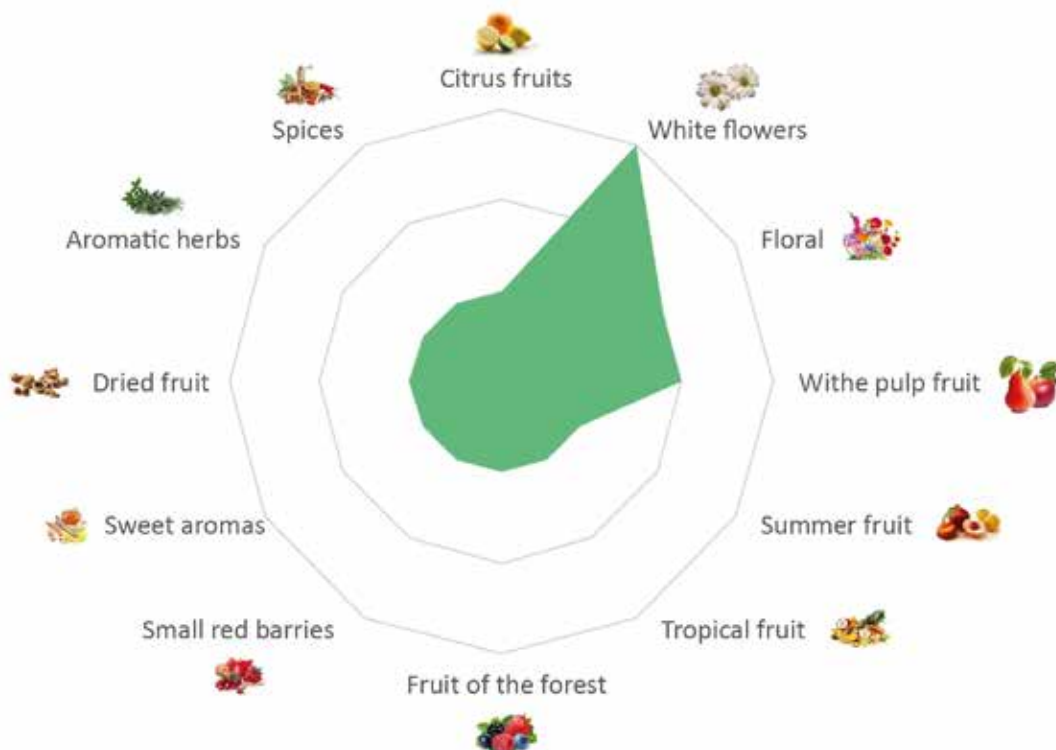
Graph: Fermol Charmat

Fermol Complete Killer Fru

Fermol Complete Killer Fru is selected for fructophilic characteristics, which are utilized to restart stuck fermentations in red, rosé and white wines. In fact, it can metabolize the sugar fraction composed by fructose, when other strains often leave it behind.

Thanks to its killer phenotype, Fermol Complete Killer Fru quickly gains dominance by reducing the existing population of wild yeast. Because of its high alcohol tolerance, it can be inoculated in partially fermented musts. It is highly cryophilic, so is recommended for wines that are not at ideal temperatures due to sluggish conditions. This fructophilic strain, is killer factor positive and therefore an ideal choice for restarting stuck fermentations.

Available: 500 grams and 10 Kg bags



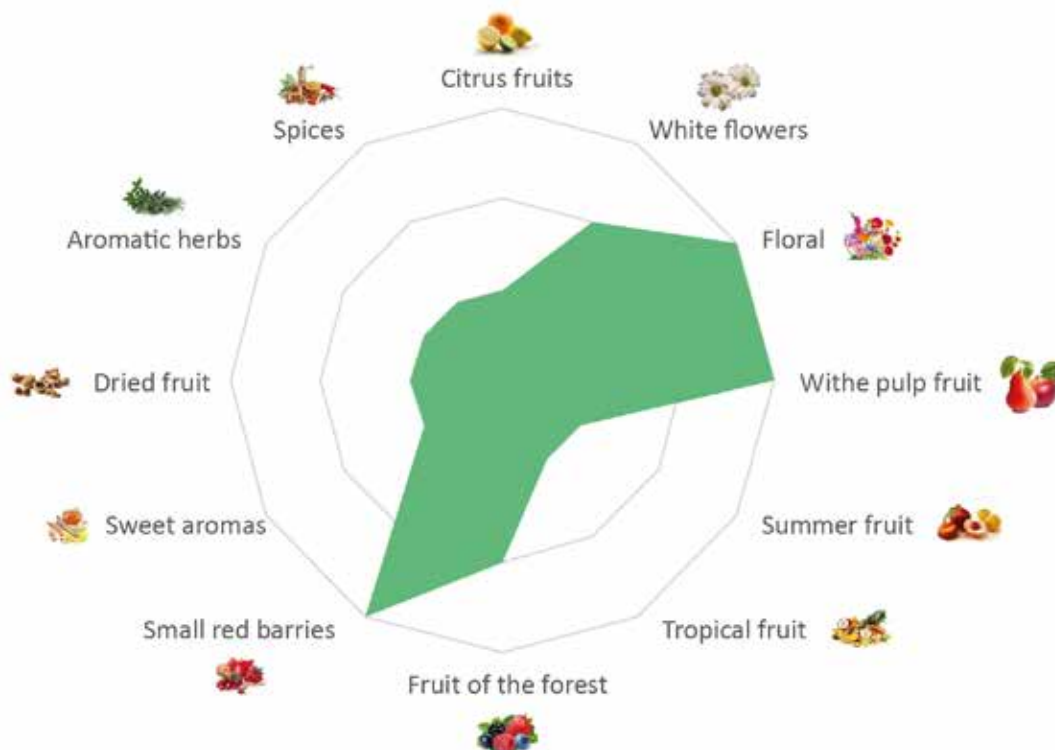
Graph: Fermol Complete Killer Fru

Fermol Cryofruit

Fermo Cryofruit has been selected for its metabolism, which shows great fermentation performance at low temperatures. Along with a high production of glycerin, which brings softness and weight to the wine, this strain allows winemakers to get the best results when used at low temperatures. During inoculation and fermentation, Fermol Cryofruit enhances the production of thiols by boosting the perception of white fruit and floral nuances in white wines, and small berries and violets in reds.

It is resistant to sulfur dioxide, has a short lag-phase and good ethanol tolerance. Ideal for Gamay, Syrah, Riesling, Traminer and all semi-aromatic varietal.

Available: 500 grams and 10 Kg bags



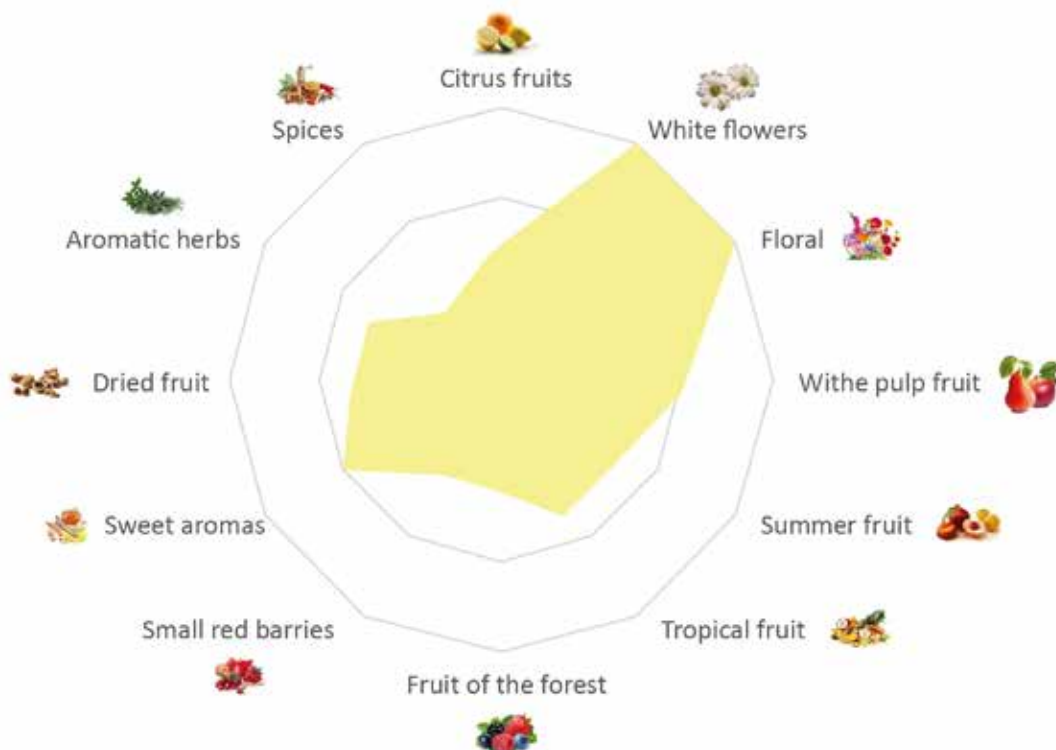
Graph: Fermol Cryofruit

Fermol Fleur

Fermol Fleur is a strain isolated by the French Vine and Wine Institute (IFV Nantes), which enhances floral ester production. It is ideal for varieties like Grüner, where floral expression is expected, but it is also suggested for all types of winemaking where floral aromatic notes are desired in the nose and on the palate.

It is widely used in whites, but also used for modern rosé wines, where winemakers seek a very pronounced and intense bouquet. Because of its low consumption of malic acid, it is also suited for fermentations of musts from hot regions to maintain freshness. The bouquet developed by Fermol Fleur is reminiscent of white flowers, and lingering notes of balsamic and menthol on the finish.

Available: 500 grams and 10 Kg bags



Graph: Fermol Fleur

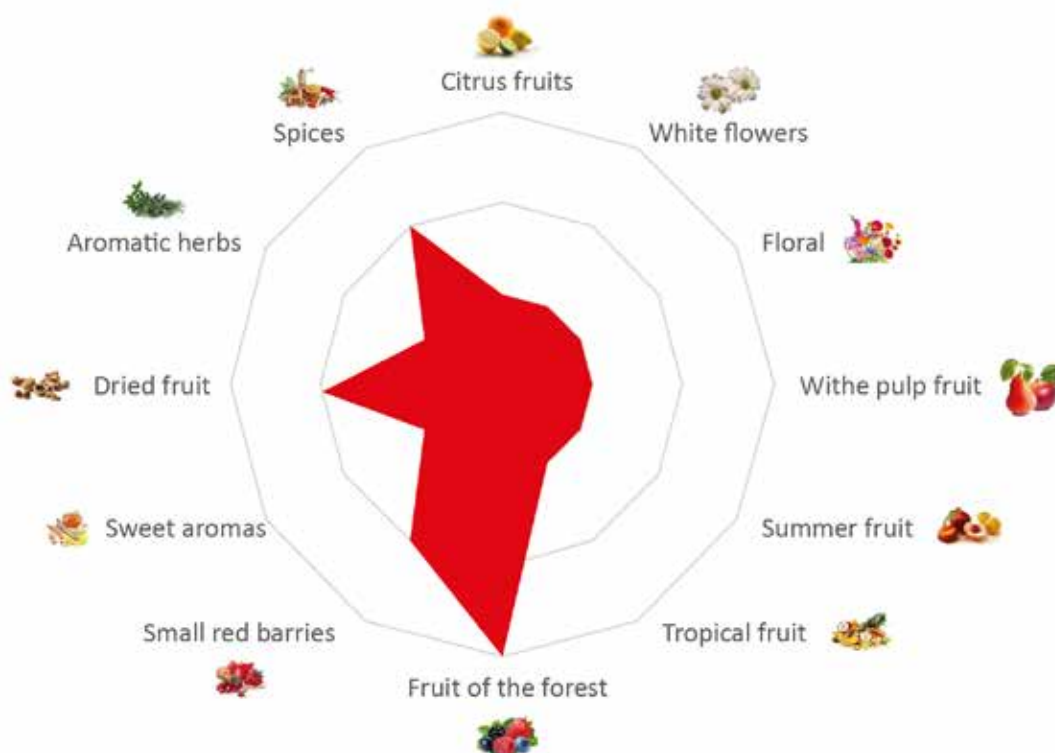
Fermol Grand Rouge

Fermol Grand Rouge is a yeast strain, meticulously isolated by the esteemed Navarra Institute for Oenological Research (Spain) and rigorously selected by the Agricultural Science Department, University of Modena and Reggio Emilia (Italy). It is a testament to our commitment to providing the highest quality winemaking products.

This yeast strain is dominant in the must, and naturally prevails over indigenous yeasts. It is a versatile tool in your winemaking arsenal. The characteristics, such as a short lag phase, minimal nutritional requirements, high ethanol tolerance, and resistance to high temperatures, make Fermol Grand Rouge the ideal choice for a variety of winemaking scenarios. These characteristics also allow for limiting the use of sulfur dioxide. Fermol Grand Rouge produces wines with good tannic structure and extremely clean aromas, where the varietal nuances are easily identified. Due to its rigorous nature, it can be used for refermentation and when musts are enriched with concentrate.



Available: 500 grams and 10 Kg bags



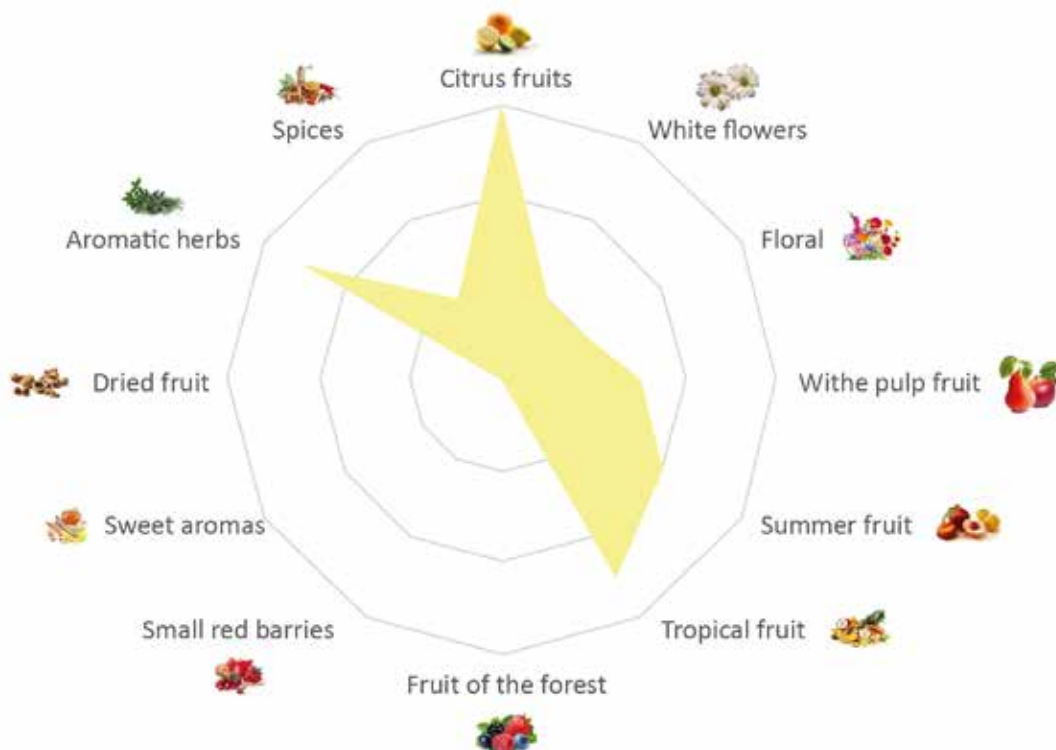
Graph: Fermol Grand Rouge

Fermol Lime

Fermol Lime naturally enhances the citrusy profile of varieties known for their bouquet, rich in lemon and grapefruit notes. Certain wineries in New Zealand have successfully diversified the characteristics of generic Sauvignon Blanc. Moving away from the classic “cat pee” and tropical thiols and moving more toward grapefruit and citrus aromas.

Because of its low consumption of malic acid, it is also indicated for fermenting musts from hot regions to maintain freshness. Fermol Lime is recommended on Pinot Grigio, Sauvignon Blanc, Grüner Veltliner, and other cold-climate varieties. When fed with the most modern, amino acids-based yeast nutrients like Fermoplus Floral, the characteristics of citrus and herbal aromas are boosted.

Available: 500 grams and 10 Kg bags



Graph: Fermol Lime

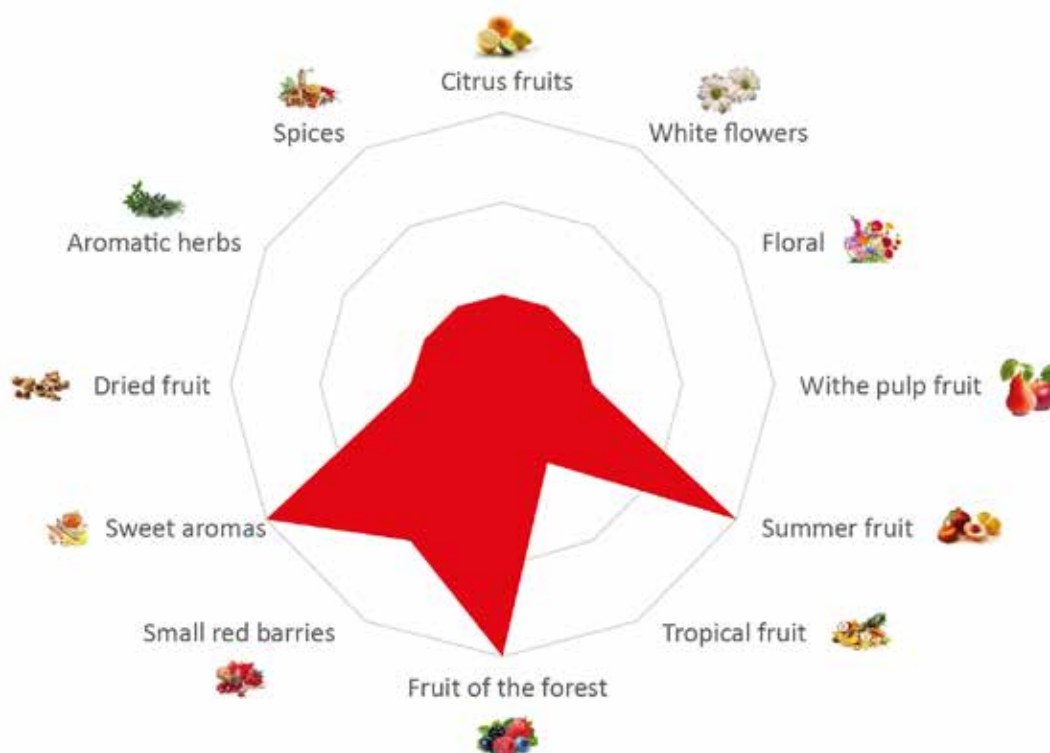
Fermol Méditerranée

Fermol Méditerranée is a strain isolated for the production of warm, full-bodied wines. It is suitable for aging, but is already very pleasant at the end of fermentation. It produces a high quantity of polysaccharides and mannoproteins, which, besides harmonizing the mid-palate, improve color stability and smoothes tannin structure.

From an aromatic point of view, Fermol Méditerranée highlights the varietal complexity and boosts the sweet nuances reminiscent of jam of ripe figs, red currants and cherries. It is ideal for organic winemaking because of the low YAN requirements. It has extremely low nutrition needs and consequently, low hydrogen sulfite production during fermentation. This strain carries a killer phenotype that helps it to dominate the fermentation, quickly minimizing volatile acidity production.



Available: 500 grams and 10 Kg bags



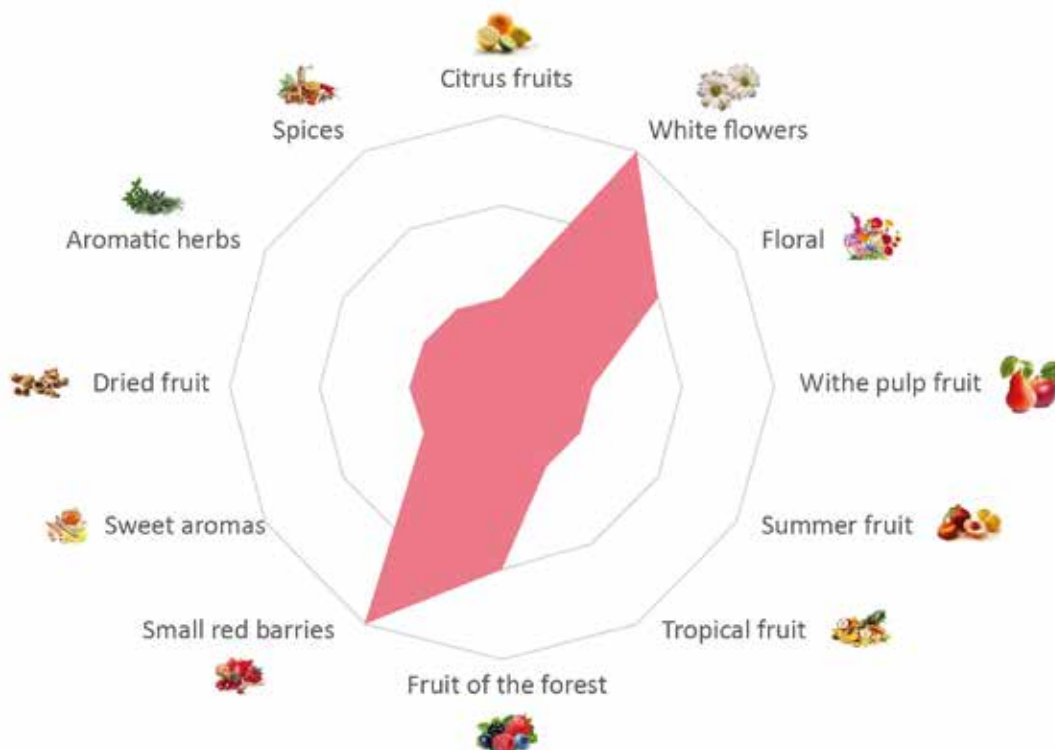
Graph: Fermol Méditerranée

Fermol PB2033

Fermol PB2033 is a strain selected in France, in the Côtes de Provence area. It is particularly suitable to produce French-style rosé and young red wines. It has a wide temperature range of fermentation (12-34°C) with a short lag phase and regular kinetics that allow for an easier control of fermentation temperatures.

The typical bouquet is reminiscent of red currant, sour black cherries, raspberries, strawberries, and white flowers. Thanks to the limited hydrophilic characteristics of the cellular wall, this strain limits the adsorption and fixation of the anthocyanins, promoting an optimized rosé color. Killer factor neutral.

Available: 500 grams and 10 Kg bags



Graph: Fermol PB2033

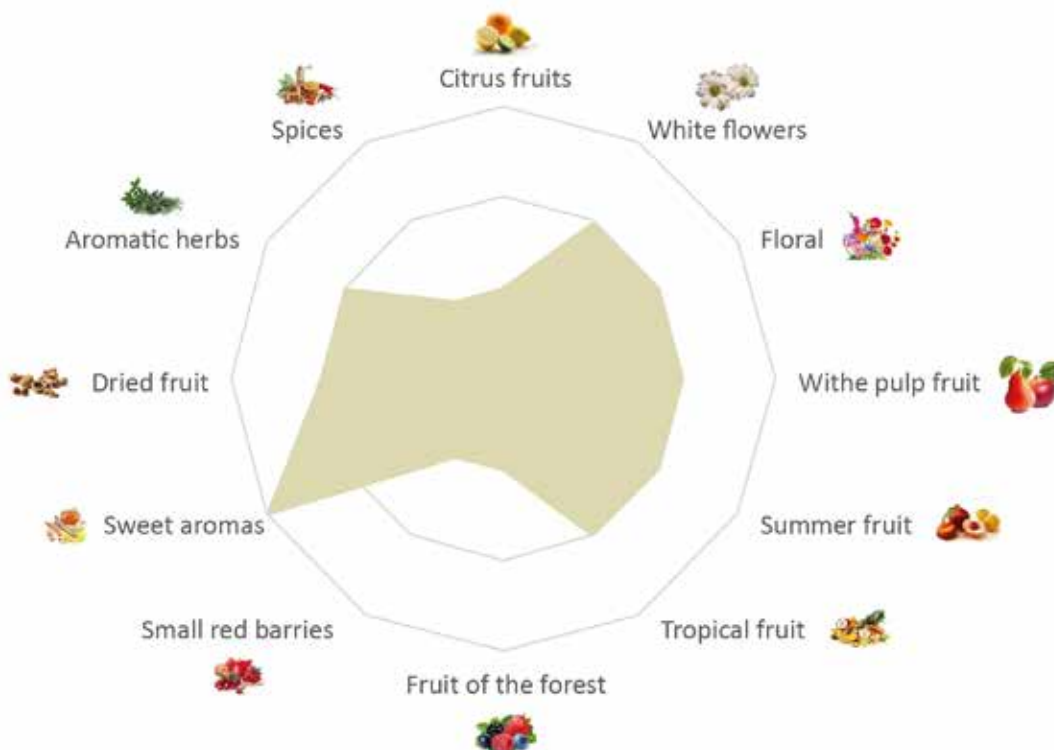
Fermol Perle

Fermol Perle is a yeast for secondary fermentation selected by the University of Reggio Emilia. It originated with hybridization between *Saccharomyces cerevisiae* crossed with *Saccharomyces uvarum*, and was chosen for its resistance to weak acids. Weak acids can often decrease the performance of *Saccharomyces* strains and cause sluggish fermentations and off-odors.

The high concentration of carbon dioxide present during fermentation in bottles or pressurized tanks causes the formation of carbonic acid. The presence of this weak acid can influence the yeast's membrane potential, as the carbonic acid can dissociate and release hydrogen ions. These protons affect the yeast's membrane potential, because they enter the cell and cause a decrease in intracellular pH. Additionally, they can influence the function of some membrane proteins and transport of ions across the membrane. The hybridization with the Uvarum strain also gives Fermol Perle a notable resistance to cold temperatures.



Available: 500 grams and 10 Kg bags

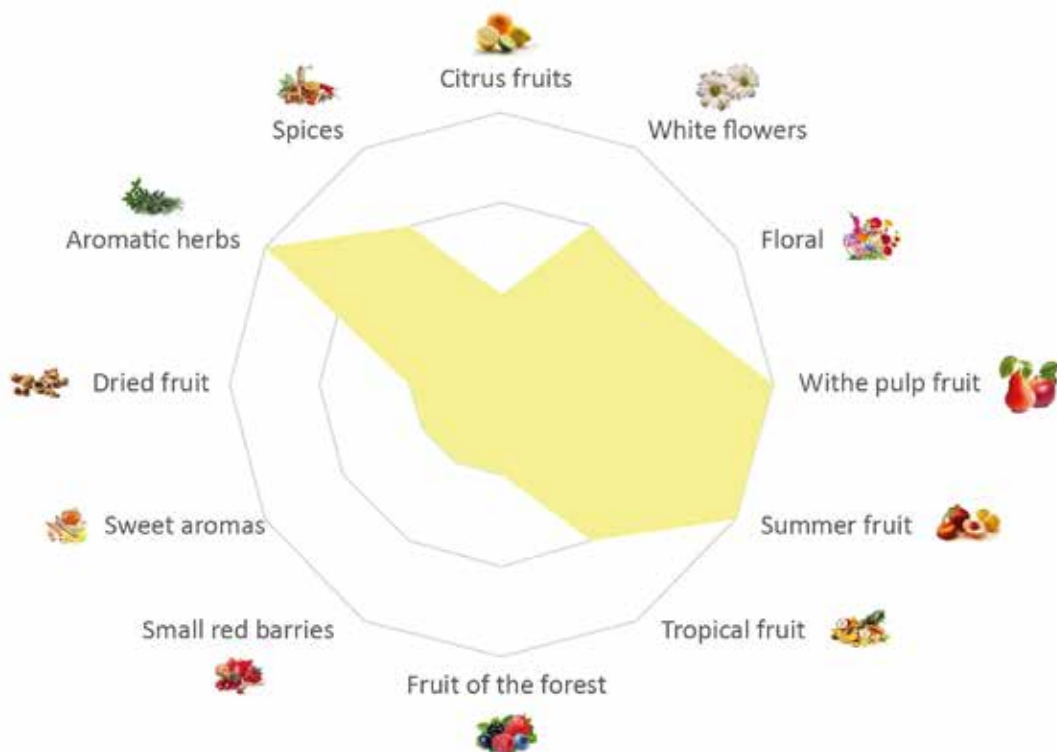


Graph: Fermol Perle

Fermol PMD 53

Fermol PMD 53 is recommended for the fermentation of musts in warm climates or where the acidity makes a difference in the quality of the final wine, such as, Riesling, Semillon, and Traminer. It has a high thiol production and other than Sauvignon Blanc, it has been used successfully in Italy with semi-aromatic varieties such as Vermentino and Falanghina.

Available: 500 grams and 10 Kg bags

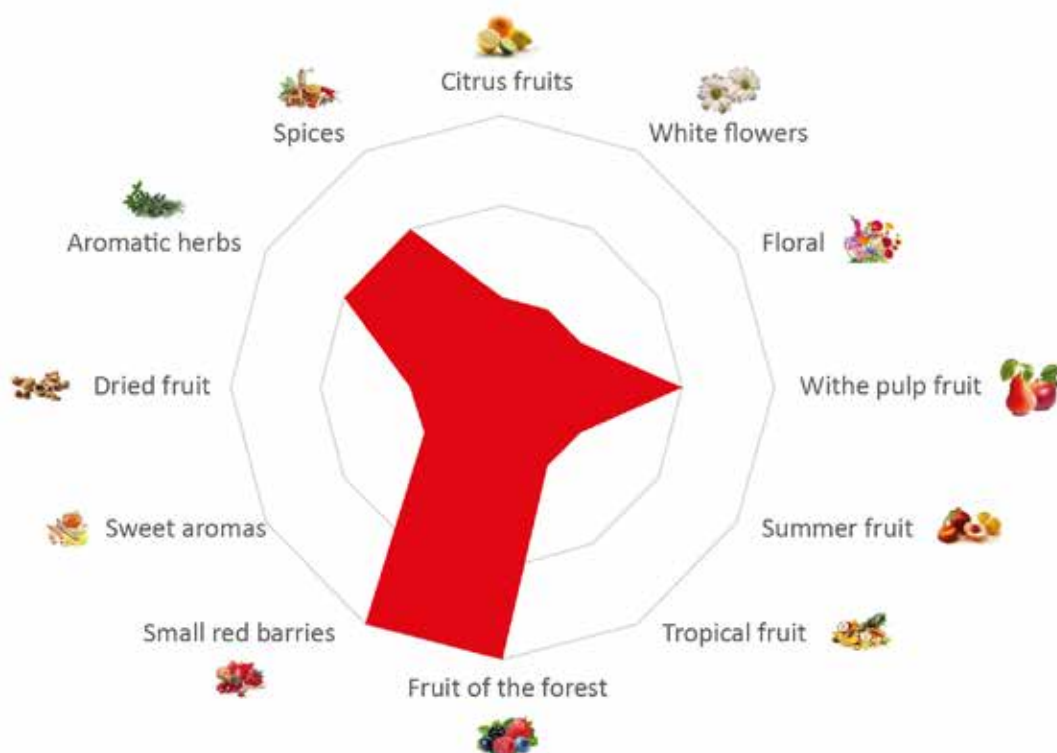


Graph: Fermol PMD 53

Fermol Premier Cru

Fermol Premier Cru is selected to produce structured and complex wines which are suitable for aging. It develops intense and clean aromatic notes and produces extremely low levels of hydrogen sulfide. It enhances the complexity and typicity of the grape varieties. It will also express a good full-bodied mouthfeel, due to its ability to produce significant amounts of glycerin, polysaccharides and to extract polyphenols.

Available: 500 grams and 10 Kg bags

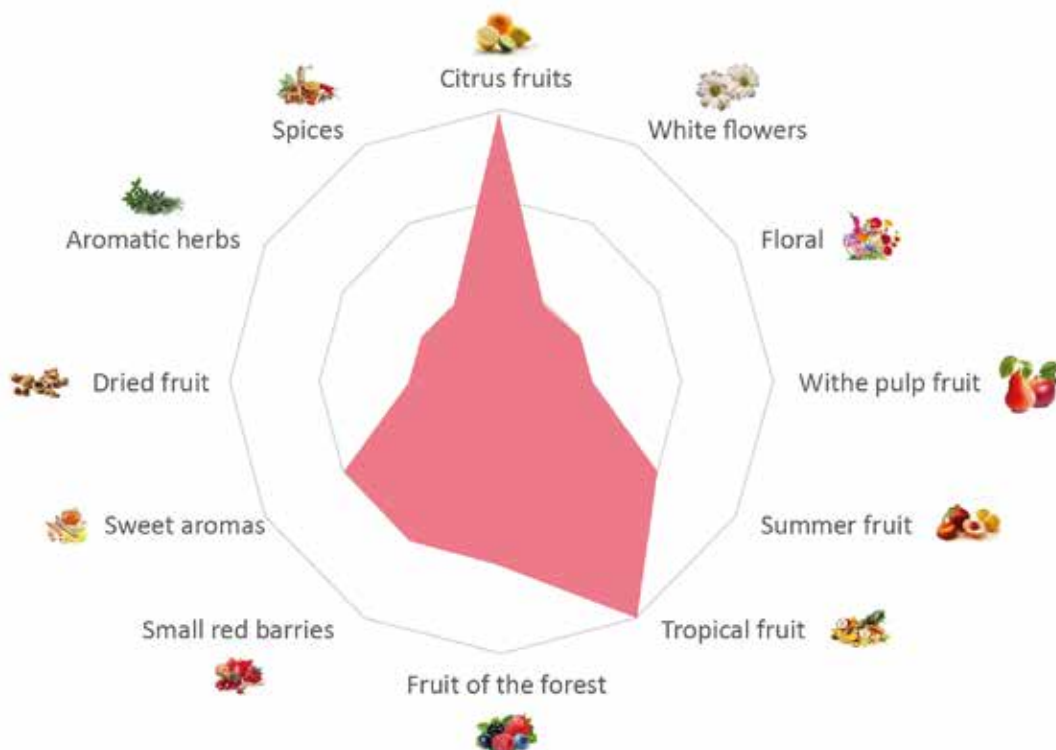


Graph: Fermol Premier Cru

Fermol Red Bouquet

Fermol Red Bouquet is a strain for red and rosé wines selected by the French Vine and Wine Institute (IFV Nantes). It is extremely dominant and therefore minimizes the risks of off-odors and stuck fermentations caused by indigenous yeast. Because of its ability to produce thiols from sulfur containing precursors, it characterizes red and rosé wines with nuances of blackcurrant, plums and violets. Another characteristic of Fermol Red Bouquet is a very high ability to produce glycerol therefore giving to the wine a smooth midpalate. It does not consume malic acid, thereby keeping wines fresh or ready for ML bacteria. Fermol Red Bouquet has a low need for YAN, it has minimal or no sulfur dioxide production, facilitates malolactic fermentation and is killer factor neutral.

Available: 500 grams and 10 Kg bags



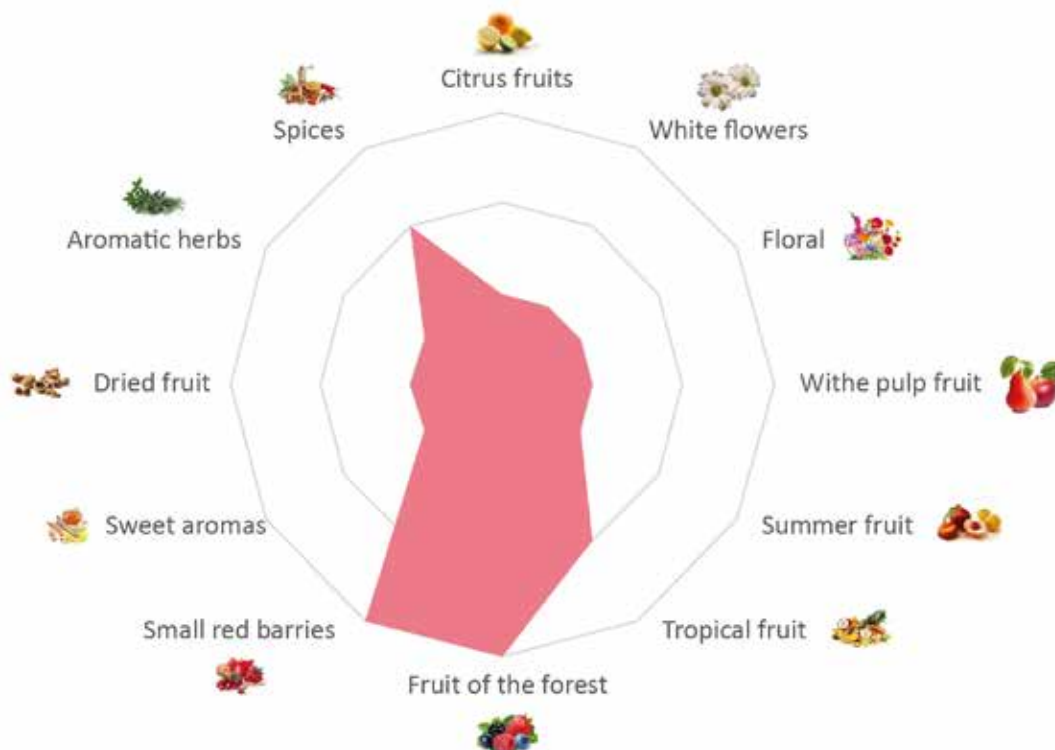
Graph: Fermol Red Bouquet

Fermol Red Fruit

Fermol Red Fruit is selected and controlled by University of Modena and Reggio Emilia. It is obtained from the hybridization of two strains: Fermol Iper R and Fermol PB2033, which are yeasts selected to express clean and well-defined fresh aromatics. It is recommended in wines to be enjoyed young where aromatic notes such as, blueberries, black currants and raspberries need be highlighted through the expression of natural precursors. Thanks to its modest nutritional demand, it is ideal for musts with low YAN and ferments free of reduction notes. However, a proper nutritional program with products like Fermoplus Red Berry or Fermoplus Cocoa, will help to increase the aromatic notes. Fermol Red Fruit has been selected with a hybridization strategy to obtain a *Saccharomyces cerevisiae* strain to perform under high stress conditions, such as in musts with high sugar content.



Available: 500 grams and 10 Kg bags

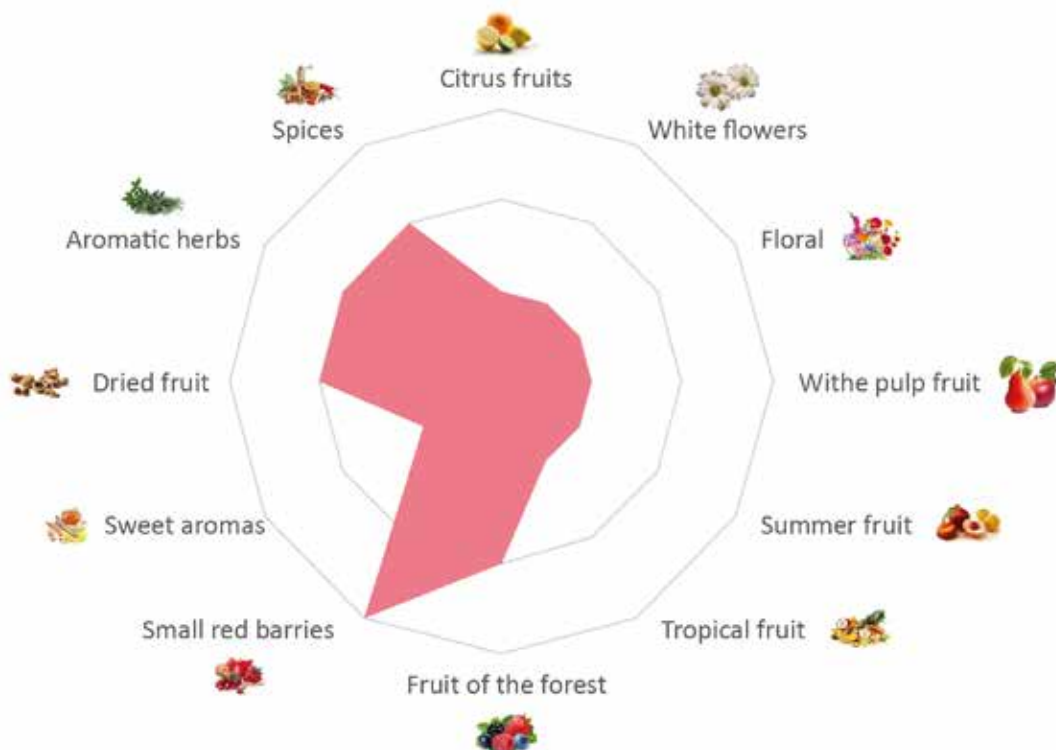


Graph: Fermol Red Fruit

Fermol Rouge

Fermol Rouge is a work horse for the fermentation of red wines where conditions are extreme, such as, must fermenting at high temperatures, low nutrition and when trying to optimize tank turnover. Its performance is consistent thanks to its vigor and resistance to adverse conditions that make Fermol Rouge rapidly prevail over the indigenous flora. It is particularly recommended for the production of rosé, young reds and wines for medium-term aging with intense red berry aromas and medium structure. Furthermore, when compared to other similar strains, Fermol Rouge produces wines with more intense color given its ability to fix the coloring substances extracted during maceration.

Available: 500 grams and 10 Kg bags

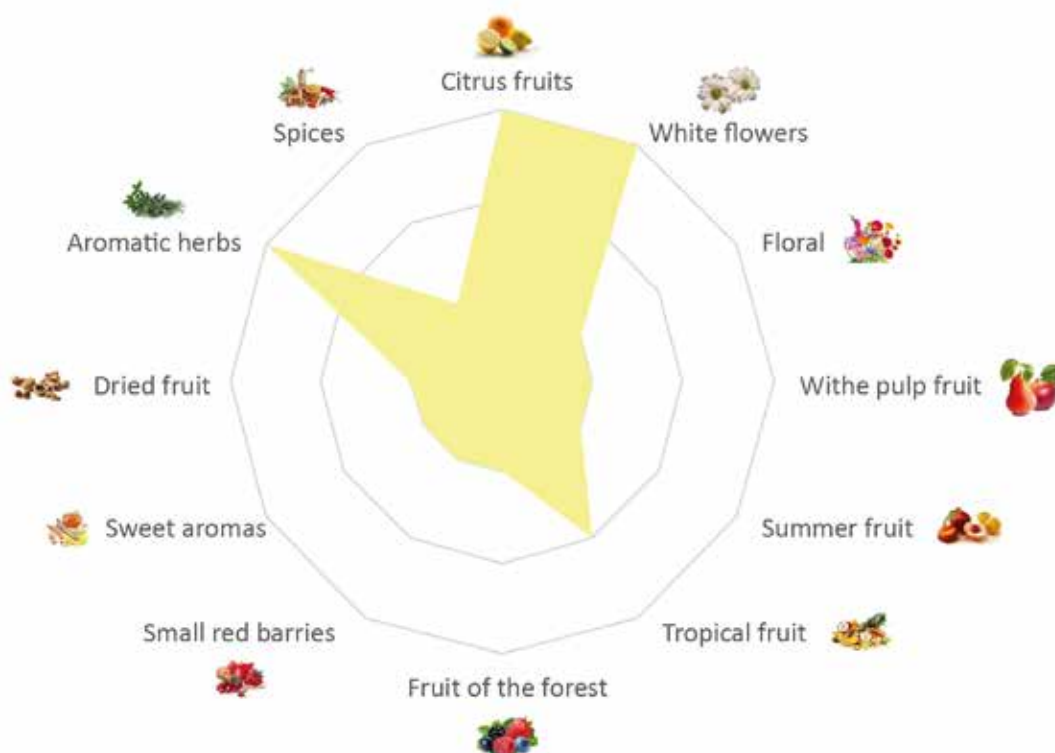


Graph: Fermol Rouge

Fermol Sauvignon

Fermol Sauvignon is a strain isolated in nature which features the IRC7 gene, which encodes a β -lyase responsible for production of the varietal thiol 4-mercapto-4-methylpentan-2-one in wine. This ability helps to free thiols from their precursors, like cysteine and glutathione and boosts the perception of these aromatics. As it produces wines rich in olfactory intensity, it is indicated both for the production of New Zealand style Sauvignon Blanc and for lending complexity to Viognier, Verdelho, Traminer, Tocai, Garganega and more generally, to white wines rich in thiolic precursors.

Available: 500 grams and 10 Kg bags



Graph: Fermol Sauvignon

Fermol Super 16

Fermol Super 16 is a very versatile yeast, which in California has found its match with Zinfandel and high end Cabernet Sauvignon. In fact, comparative trials have showed how Fermol Super 16 has an higher than average production of extractive enzymes and facilitates maceration.

Fermol Super 16 has been isolated from grapes picked on the island of Samos, Greece. The island is a historic producer of wines coming from extremely mature grapes often dried in a “passito” style. As a result of its origins, this strain is adapted to high sugar content and extreme osmotic conditions. It is ideal for wines made with a high percentage of raisins and overripe grapes.

Fermol Super 16 yields a clean fermentation, to produce wines with a crisp and fresh bouquet, leading to long, complex finish. It can perform at very high temperatures and high alcohol. The cells flocculate well and the wine is easy to filter just a few days after the end of the fermentation.



Available: 500 grams



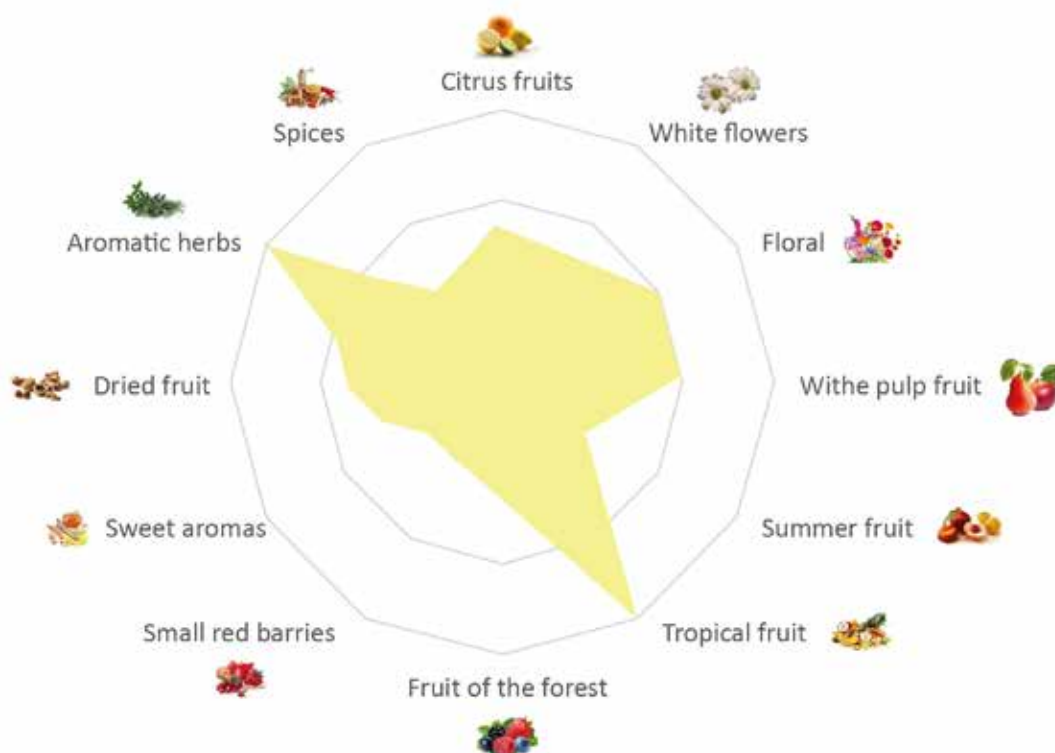
Graph: Fermol Super 16

Fermol Tropical

Fermol Tropical is a yeast strain selected by the French Vine and Wine Institute (IFV Nantes), and derived from hybridization. It is ideal in all vinifications where the complexity of the thiols needs to span from tropical and ripe to elegant and complex. The bouquet developing from the fermentation with Fermol Tropical is reminiscent of summer and tropical fruit with hints of sage and aromatic herbs.

It is recommended for Fumé Blanc style Sauvignon Blanc, Chardonnay, Marsanne, Viognier, Muller-Thurgau, Grillo, and many other grape varieties. The sulfur containing precursors push the yeast in a direction where the ideal nutrition is with Fermoplus Tropical.

Available: 500 grams and 10 Kg bags



Graph: Fermol Tropical

Non-Saccharomyces Certified Organic and Bio-protection YEAST

Yeast	Strain
Levulia Alcomeno	<i>Lachancea thermotolerans</i>
Levulia Cristal	<i>Saccharomyces Cerevisiae</i>
Levulia Probios	<i>Saccharomyces Cerevisiae</i>
Levulia Torula	<i>Torulaspora delbrueckii</i>
Primaflora	<i>Metschnikowia pulcherrima</i>

Chart: Non-Sacch, Certified Organic and Bio-protection Yeast



Levulia Alcomeno (Certified Organic Yeast)



Levulia Alcomeno belongs to the species *Lachancea thermotolerans*, a yeast strain naturally present on the grape berries, contributing organoleptic complexity of wine during the early stages of alcoholic fermentation. Levulia Alcomeno carries out lactic fermentation from sugars and brings freshness to the wine by adding to the total acidity and lowering the alcohol content. Levulia Alcomeno can guarantee alcoholic fermentation up to 7% of the volume. It is used in sequential inoculation, finishing the sugars with a *Cerevisiae* strain. This inoculation must be performed at the beginning of fermentation instead of *Saccharomyces cerevisiae*. After three days of active fermentation (5-7 °Brix drop), reinoculate with the desired *Saccharomyces cerevisiae*.

Killer factor neutral.
Certified Organic.

Available: 500 grams



Levulia Cristal

Levulia Cristal is a *Bayanus* yeast selected in the Champagne region of France, and widely used in the area for the production of method Champenoise sparkling wines. It features a high resistance to alcohol and a high flocculation, which make it ideal for the traditional method, with prise de mousse and disgorgement.

For alcoholic fermentation: Safe fermentation with complete sugar consumption, low production of volatile acidity, low foam production.

For secondary fermentation: Good flocculation, good resistance to alcohol, suitable for the preparation of pied de cuve.

Available: 500 grams





Levulia Probios (Certified Organic Yeast)



Levulia Probios is an organic certified yeast derived from a selection conducted in the Champagne region of France. Its excellent fermentation vigor, even under challenging conditions of pH, temperature, and alcohol, makes it a good choice for base red, white, and rosé wine production. It is also ideal for the “prise de mousse” in bottle and pressurized tanks.

Levulia Probios allows for secure fermentation, with total sugar consumption and deficient production of undesired by-products such as volatile acidity, hydrogen sulfide, pyruvic acid, and sulfur dioxide. It is also suitable for producing still white wines and its features guarantee the production of dry, aromatic wines, respecting the varietal’s characteristics.



Certified Organic.

Available: 500 grams

Levulia Torula



Levulia Torula is a yeast strain belonging to the species *Torulaspora delbrueckii* and is the result of a research program on microbial ecology that has allowed the isolation of different non-*Saccharomyces* yeast species. This selection from different regions of Burgundy was made in collaboration with the University of Vine and Wine (IUVVB) of Dijon (France). It is known for its high production of tropical thiols and polysaccharides to contribute significantly to the bouquet and to the organoleptic complexity of the wine.

In fact, because of the enzymatic activities (glucosidase and sulfur-lyase), Levulia Torula is the optimal yeast for enhancing the varietal of aromatic and semi-aromatic grapes like Sauvignon Blanc, Chardonnay, Gewurztraminer, Colombard, Riesling, Muscat, Sémillon, and Chenin.

Levulia Torula should be used in sequential inoculation, 48 hours before the induction of the strain *Saccharomyces cerevisiae*. Its rapid implantation in the must makes it an ideal tool to limit the spontaneous development of other unwanted indigenous yeast strains.

As soon as *Saccharomyces cerevisiae* develops, the *Torulaspora delbrueckii* population dies and begins its autolysis rapidly during alcoholic fermentation. Therefore, Levulia Torula contributes to its proper development by supplying nutrients and detoxifying the environment. It also reduces the sensations of astringency due to the release of polysaccharides. During this phase, it also has the ability to keep spoilage microorganisms at bay. Levulia Torula has very low acetic acid production in high sugar must, making it ideal for sweet or late harvest wines.

Certified Organic.

Available: 500 grams



Levulia T.P.CO

Levulia T.P.CO is utilized for big, fruity reds, from Australian-style Syrah to Bordeaux varieties. It is the result of a process of hybridization and selection conducted by the French Institute of Vine and Wine (IFV Nantes). The yeast was chosen following a multi-stage strategy where selected strains were tested on red grape varieties, Syrah and Merlot, by evaluating various technological parameters such as implantation capacity (prevalence over wild yeast) and fermentative performance (kinetics and analytical profile at the end of fermentation).

Levulia T.P.CO produces intense and persistent floral and fruity aromas, phenolics extraction, and high glycerol production. It features a killer phenotype and the gene IRC7 to encode beta-lyase activity to release thiols from their precursors.

Because of this, it produces a rich bouquet of black fruits like blueberries and blackberries. It is a strain with very low nutritional needs, resistant to high alcohol (up to 16.5% by volume) and high sulfur dioxide. Its optimal fermentation temperature is 18-25°C.



Available: 500 grams



Cultures for Bio-protection and low sulfur dioxide winemaking

Primaflora VB BIO and VR BIO



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

Main enzymatic activities:

- 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: 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 /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 must rich in sulfur dioxide.

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

Certified Organic.

Available: 500 grams



BIOREACTOR X10 1.5: a new tool to ensure optimal rehydration of dry yeast and biomass propagation

Yeast inoculation represents the first technological step in producing quality wines. This is true, provided that the selected yeast can take over and complete the fermentation with adequate and rational nutrition. Yeast, as a microorganism, is very rapid in multiplying and propagating its biomass. However, if conditions are not optimized (ideal aerobic environment and a proper carbon and micro element supply) the yeast could lack the strength to complete fermentation. In worse cases, unwanted metabolites can be created in wine that could compromise its quality.

This is true whether we just do 2-4 generations or take this technique to the extreme.

AEB engineering's team of experts has been able to well interpret the needs in this field by designing the Bioreactor X10 1.5. It guarantees rehydration of yeast and the subsequent propagation of biomass without having stressed cells. Practically speaking, in a 24 hour cycle, with 5 kilograms of yeast (appropriate for 200 hL or 5,300 gallons) the winery will obtain the equivalent of about 50 kilograms of biomass (appropriate for 2,500 hL or 66,000 gallons).

The Bioreactor also comes with its own cleaning CIP that washes the system automatically in about 10 minutes (3 steps: prewash, cleaning and rinse).



BIOREACTOR X10 1.5:

- 1500-liter closed tank
- Integrated cooling system operated by solenoid valves
- Radar level sensor for liquid/volume addition management
- PT 100 temperature probe
- Additional vortex breaker
- Specific agitator built by AEB engineering with flanged gear motor
- 15 Kw resistor
- Aeration system with sintered stainless-steel cartridges
- 3-stage water filter, PP 5 prefilter, activated carbon cartridge and nylon 66 0.22
- Pneumatic air regulation system
- Feed batch dosing system with pump for sugar and nutrient
- Stainless steel framework
- Dual washing system with detergent dosing with 2 spray balls
- Two connectors for external ON-OFF timed control for pump or agitator and air solenoid valve.



Yeast rehydration and acclimation

Using clean and sanitized equipment, prepare, 10 liters of warm water per kilogram of yeast to be rehydrated (1.2 gallons of water per pound of yeast). Ideal temperature is 39°C/102°F for *Saccharomyces cerevisiae* and 41°C /105°F for a Bayanus strain. While stirring, slowly add 1 part of the rehydration nutrient Fermoplus Energy Glu 3.0 per 4 parts of yeast.

- Be sure that all clumps are broken up and well mixed. Slowly mix-in the yeast, again making sure to break up all clumps. Do not mix using a drill or any aggressive mixing technique that might cause shearing of the yeast cells. Make sure that the mixture gets plenty of oxygenation. Oxygen along with the amino acids supplied by the Fermoplus Energy Glu 3.0, will build a bigger and stronger yeast biomass.
- After 20-30 minutes the yeast is fully rehydrated and will immediately need a sugar source to stay viable. 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. A bigger drop would stress the yeast and decrease viability.
- After 15 minutes, slowly add again an equal amount of must to the mixture, making sure the temperature does not drop more than 5°C. Repeat this step every 15 minutes until the yeast mixture is within 5°C of the tank temperature then add the inoculum to the must in the tank, making sure that the tank is properly vented to release pressure.



Restarting a stuck or sluggish fermentation procedure

- Rack the wine off the gross lees into a sanitized tank.
- While racking, add 18 g/hL (1.5 lbs /1000 gal) of AEB Celloferm to the receiving tank.
- Celloferm will help to purify the compromised must from toxins and contaminants.

Prepare the yeast:

- In a separate tub, bring some water to 40°C/104°F. Use about 250 ml of water for every hL of stuck wine to treat (2.5 gal water/1000 gallons of stuck wine) and add 6 g/hL (0.5 lbs/1000 gallons) of Fermoplus Energy Glu 3.0 rehydration nutrient.
- To this mixture, add 25g of Fermol Complete Killer Fru yeast for every hL of stuck must to be treated (2 lbs/1000 gallons) and thoroughly mix the yeast and nutrients.
- Allow the yeast to rehydrate for 20 minutes and note the temperature of the yeast mixture before going on to the next step.

Re-inoculate:

- Take out of the problematic tank, 250 mL of stuck must per hL of its total volume (2.5 gallons for every 1000 gallons of problematic wine) and add this to the yeast mixture, making sure that during the addition, the temperature does not change more than 5°C over a 10-minute period.
- 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.
- Take a sample of this starter and measure the residual sugars if possible, then cover and hold for 12 hours in a warm part of the cellar. Around 21°C /70°F is best.
- Check again the residual sugars, making sure that there are signs of active fermentation before moving to the next step (a residual sugar drop will confirm yeast activity).
- When there are signs of active fermentation, transfer this starter from the tub into a small wine tank and slowly add on top of a portion of stuck wine (about 750 mL of stuck wine per hL of total volume of stuck wine or 7.5 gallons/1000 gallons of total stuck wine), along with 15 grams of light grape concentrate per hL of total stuck wine. Then, stir well.
- Record the residual sugars and hold them overnight. Make sure the small wine tank is vented. Again, confirm that the mixture is actively fermenting before moving on.
- Add 10% of the total stuck wine to the small tank with the starter and mix well. Hold for another night.
- 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.

A stylized illustration of a woman with long brown hair and glasses, wearing a white lab coat over a dark shirt. She is holding two glasses of red wine, one in each hand, and smiling. The background shows a wine cellar with large metal fermentation tanks and wooden barrels.

CHAPTER 2

Wine yeast nutrition has elevated both the quality of the wines and the technological process in terms of time and energy. In the last 20 years, we have witnessed an evolution from using mineral ammonia like DAP as the main source of yeast available nitrogen to a more sophisticated way of getting more out of the yeast by supplying naturally derived amino acids, vitamins, and microelements, which also act as precursors for aromatics. AEB has been one of the leading companies investigating and promoting this evolution.

FERMENTATION NUTRIENTS

Containing mineral nitrogen

Enovit Perlage

Enovit Perlage is the evolution of our Enovit P, which is made with a technology that allows for better dispersion and solubilization. This characteristic of the product also helps when the nutrient is added to the re-fermentation of sparkling wines. It includes DAP and thiamine (0.3%). Enovit Perlage re-establishes the ideal level of nitrogen, as well as a balanced supplement of thiamine. The thiamine contained in Enovit Perlage partially inhibits the production of higher alcohols, which confer coarseness. It favors the formation of β -phenylmethyl alcohol, which brings an organoleptic improvement to the wine.

Usage: dissolve in must or wine and add to tank.

Dosage: 100 ppm depending on YAN content.

Enovit Perlage will bring 22 ppm of YAN for every 100 ppm.

Storage: cool dry place, away from direct sunlight and heat.

Available: 1 Kg and 25 Kg bags

TTB 27 CFR § 24.246



Fermocel P

Fermocel P is a formulation of DAP, cellulose, and thiamine that has been used for decades in the industry, especially in the fermentation of white varieties that benefit from must fining. The cellulose supports the yeast cells when the NTUs are low, and when the cold temperature of white and rosé ferments does not bring enough vigor for the yeast to stay suspended. Also, cellulose helps adsorb long-chain fatty acids and toxins.

Usage: dissolve in must or wine and add to tank at the beginning of the fermentation.

Dosage: 150-200 ppm.

Fermocel P will bring 11 ppm of YAN.

Storage: cool dry place, away from direct sunlight and heat.

Available: 25 Kg bags



Fermoplus Integrateur 20 KD 2.0

Fermoplus Integrateur 20 Kd 2.0 includes a calibrated portion of Thiamine, yeast derived amino acids, sterols and vitamins, that contribute to the health of the yeast cells as well as to the development of clean aromatics. Also, its DAP content brings along a high amount of YAN.

Usage: dissolve in must or wine and add to tank at the beginning of fermentation, and if possible, distribute the total addition in 2-3 steps.

Dosage: 200 ppm depending on YAN content. Fermoplus Integrateur 20KD 2.0 will bring 15 ppm of YAN for every 100 ppm of product added, but also will add a considerable amount of amino acids easily assimilable by the yeast.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg and 20 Kg bags

TTB 27 CFR § 24.246



Fermoplus Presto Start+

Fermoplus Presto Start+, is a nutrient that contains yeast derivatives enriched with microelements like zinc and magnesium, which are co-factors for multiple enzymes. Zinc boosts alcohol dehydrogenase activity, which converts acetaldehyde into alcohol at the end of the fermentation cycle. Magnesium activates pyruvate decarboxylase, which pushes yeast metabolism toward fermentation rather than respiration. On the contrary, lack of magnesium stimulates the pyruvate dehydrogenase activity, which promotes respiration.

In the trials performed by AEB, Fermoplus Presto Start+ facilitated prevalence, increased the biomass, and overall boosted the onset of fermentation and its speed. For this reason Fermoplus Presto Start+ is recommended for fermentations pitched with direct inoculation like Zymasil Pronto. Fermoplus Presto Start+ is also recommended for musts that have been treated with ion exchange, where micronutrients like zinc and magnesium are stripped and deficient.

Usage: dissolve in must or wine and add to tank at the beginning of the fermentation.

Dosage: 150-200 ppm. Fermoplus Presto Start will bring 8 ppm of YAN for every 100 ppm of product added.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags

TTB 27 CFR § 24.246



DAP free nutrients

Fermoplus Bravo PS-Free

Fermoplus Bravo PS-Free is a nutrient developed to provide the yeast with a boost in FAN (free amino nitrogen) without increasing the phosphates and sulphates derived from mineral nitrogen. It is strictly based on yeast derivatives without providing any particular amino acid derived aromas, but will help the yeast complete fermentation without stress.

Usage: dissolve in must or wine and add to tank at the beginning of the fermentation.

Dosage: 400-700 ppm or 3-5 lbs/1,000 gallons

Storage: cool dry place, away from direct sunlight and heat.

Available: 1 Kg and 25 Kg bags

TTB 27 CFR § 24.246



Fermoplus DAP Free

Fermoplus DAP Free is yeast derived amino acids, B-vitamins, sterols and natural micro elements. It is used for optimizing the formation of biomass when added in the early stages, and in the production of esters and integration of free amino nitrogen when introduced during fermentation.

Usage: dissolve in must or wine and add to tank at the beginning of the fermentation.

Dosage: 240-600 ppm or 2-5 lbs/1,000 gallons

Storage: cool dry place, away from direct sunlight and heat.

Available: 10 Kg and 25 Kg bags

TTB 27 CFR § 24.246



FERMOPLUS varietal line



The nutritional contribution in terms of YAN brought by this line of products is far less important than what they can do for the health of the fermentation, the production of biomass, and especially for the natural expression of esters and thiols. The availability of specific amino acids allows the yeast to conduct a regular fermentation and to enhance the varietal characteristics typical of the grape variety. In musts coming from aromatic grapes, it is essential to be able to count on compounds such as:

- Isoleucine: precursor of amyl acetates.
- Leucine: originates isoamyl esters responsible for banana notes.
- Valine: originates isobutyl acetates with nuances reminiscent of flowers and white fruits.
- Arginine: plays a role in boosting typicity and helping a more complex aromatic profile.

With the addition of these nutrients the yeast will benefit from the free amino acid nitrogen fraction (FAN), but also from the content in:

- Sterols: to reinforce the membrane and withstand stresses due to high temperature and alcohol content. These are conditions which make the proton pump less efficient, by lowering the pH of the cytoplasm and damaging the membrane potential, ultimately stressing and killing the cell.
- Amino acids: source of nitrogen, precursors of aromatics like acetate esters and important boosters for biomass production.
- Sulfur containing compounds like glutathione and cysteine: important natural antioxidants for the optimization of the redox potential and the production of aromatic thiols.

Timing of Addition:

To optimize the aroma boosting promoted by the following nutrients we recommend that they are added between the second and fifth day of the alcoholic fermentation.

For musts that are particularly lacking in yeast available nitrogen, we recommend adjusting its level with Enovit Perlage, Fermoplus Integrateur, Fermoplus Presto Start+, or Fermocel P at the beginning of fermentation.

Fermoplus Cocoa

Fermoplus Cocoa is a yeast derived nutrient, which shares the same fruity and spicy precursors of the Negramaro grape variety. It enhances the natural aromas of plum, cherry, and violet in younger wines and chocolate, tobacco, cigar box and carob in wines meant for aging.

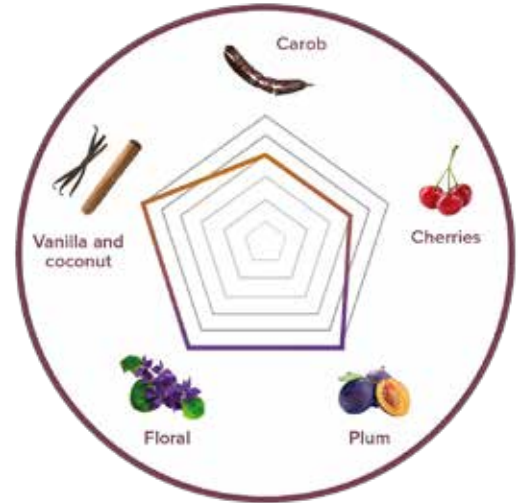


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Cocoa Precursors

Fermoplus Floral

Fermoplus Floral contains yeast-derived amino acids, which are prevalent in the composition of this nutrient to boost an aromatic profile reminiscent of roses and white flowers. It is a nutrient recommended for varieties like Pinot Grigio, Trebbiano, Grüner Vetliner, Marsanne and wherever the winemaker aims to boost a floral bouquet.

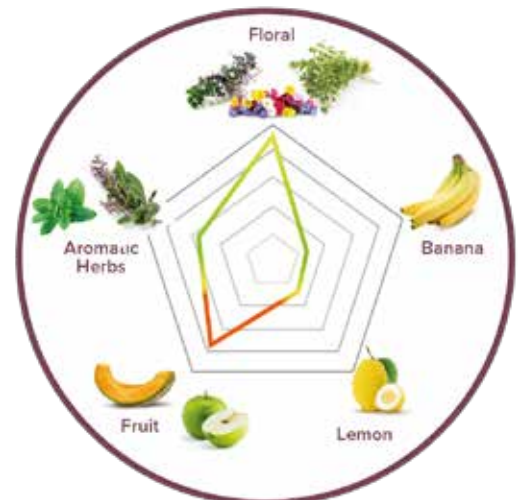


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 Gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Floral Precursors

Fermoplus Tropical

The high content in yeast-derived, selected amino acids in Fermoplus Tropical allows for a boosted release of ripe fruit aromatics. This makes it ideal for the fermentation of varieties like Chardonnay and Viognier but also Syrah and Tempranillo.

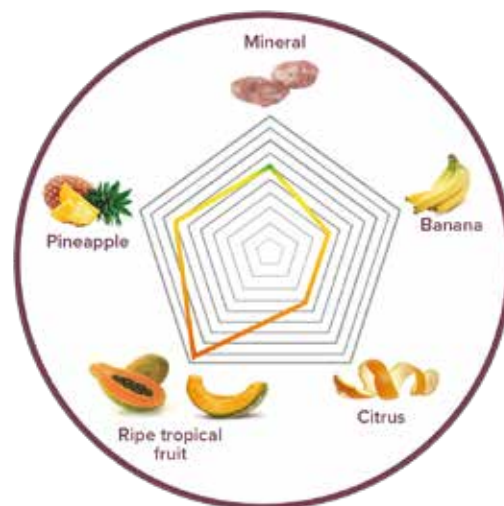


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Tropical Precursors

Fermoplus Sauvignon

Fermoplus Sauvignon is a nutrient made up with yeast derivatives rich in cysteine and glutathione, which are sulfur containing compounds precursors of aromatic thiols such as, 4MMP (Box tree), 3MH (Citrus) and 3 MHA (Tropical). This nutrient works better with yeast featuring the IRC7 gene to encode the synthesis of particular β -lyases (Fermol Sauvignon, PMD 53, Fermol Lime, Fermol Fleur, Fermol Tropical). Fermoplus Sauvignon also contains some tannins from grape skins, which carry more precursors of the same aromatics.

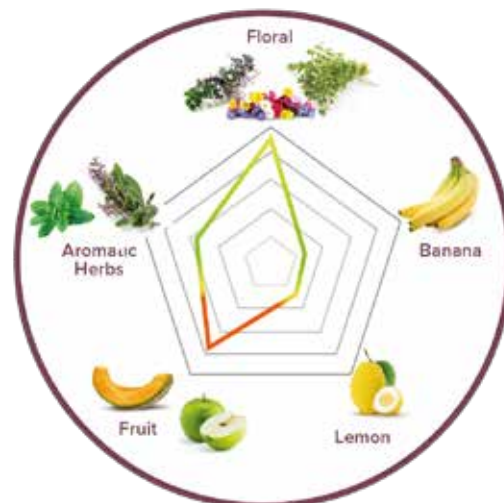


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Sauvignon Precursors

Fermoplus Non Sacch

Fermoplus Non Sacch is a 100% organic complex nutrient based on yeast hulls and autolyzed yeasts rich in amino acids and micro elements. It is geared to optimize the biological activities and the aromatic expression of strains belonging to the *Metschnikowia pulcherrima*, *Lachancea thermotolerans* and *Torulaspora delbrueckii* species.

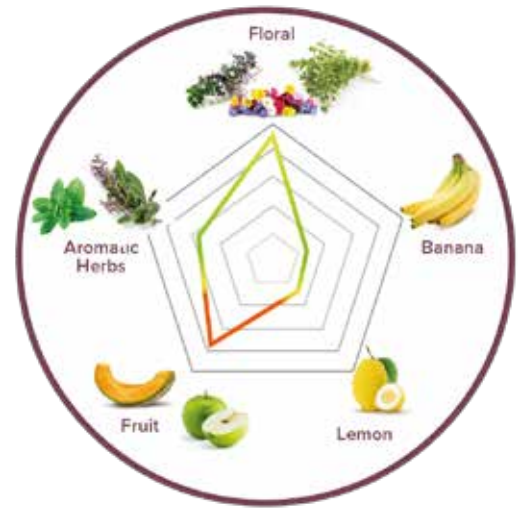


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

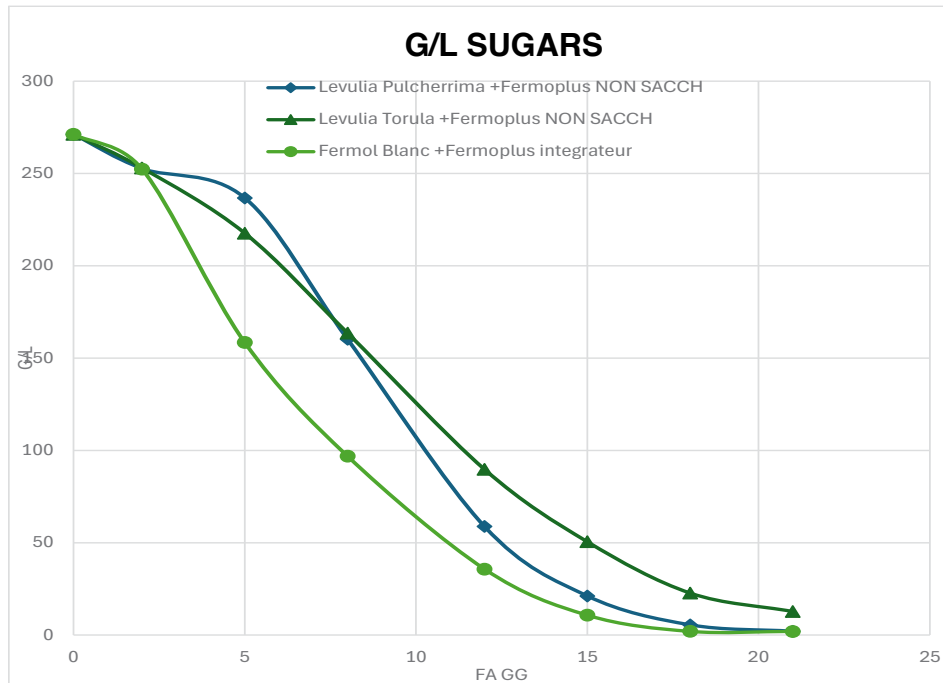
Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

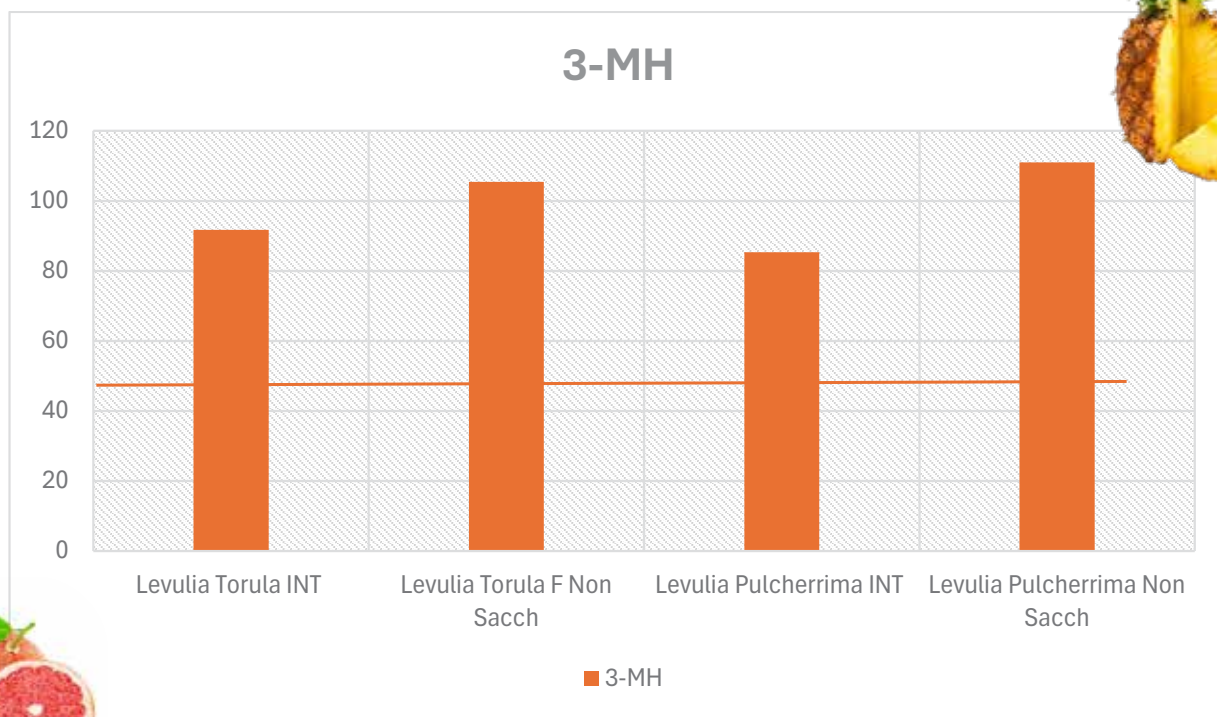
Available: 1 Kg bags
TTB 27 CFR § 24.246



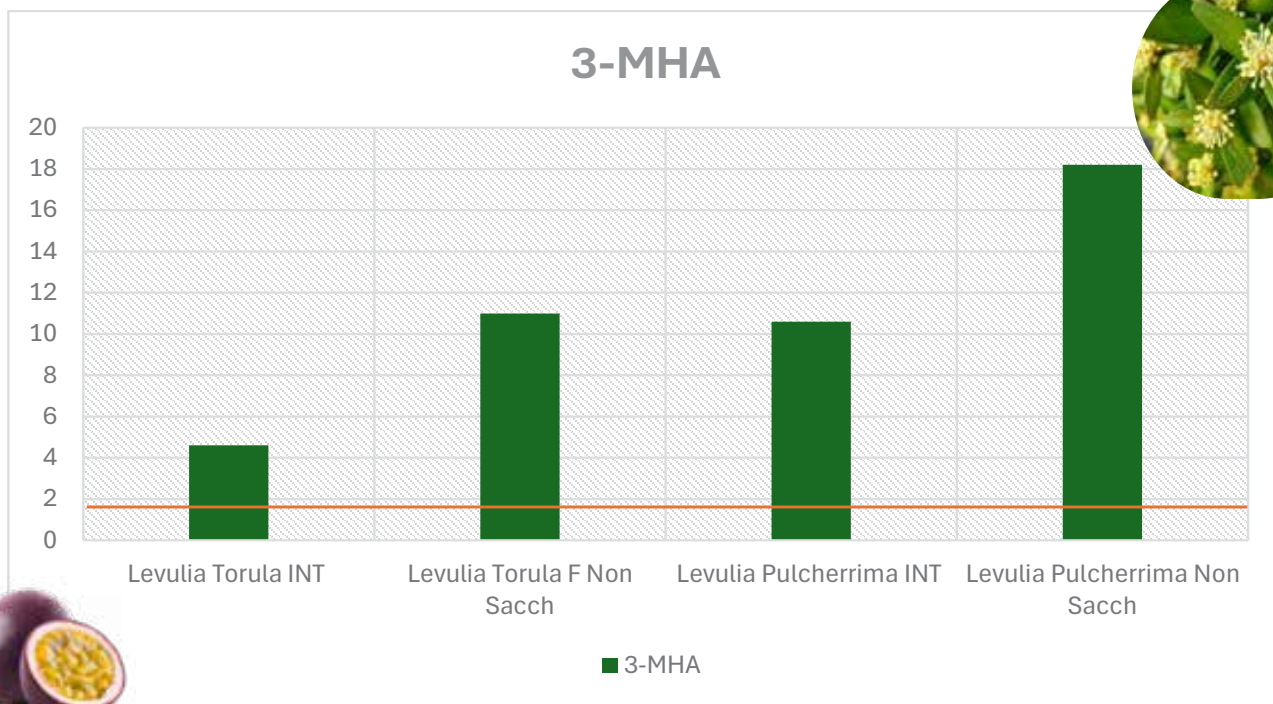
Graph: Fermoplus Non Sacch Precursors



Graph: Kinetics of sugar consumption with pure inoculation and fermentation carried out at 16°C by non-Saccharomyces yeast using Fermoplus Non-Sacch Vs a standard complex nutrient



Graph: 3-mercaptohexanol produced by non-Sacch yeast fed with Fermoplus Non Sacch compared to the same strains fed with Fermoplus Integrator 20 KD 2.0



Graph: 3-mercaptohexyl acetate produced by non-Sacch yeast fed with Fermoplus Non Sacch compared to the same strains fed with Fermoplus Integrator 20 KD 2.0

Fermoplus Prosecco

Fermoplus Prosecco is formulated taking inspiration from the HPLC peaks of amino acids contained in the Glera must. It enhances the typical aromas of white flowers and citrus desired in base wines produced in the Charmat method.

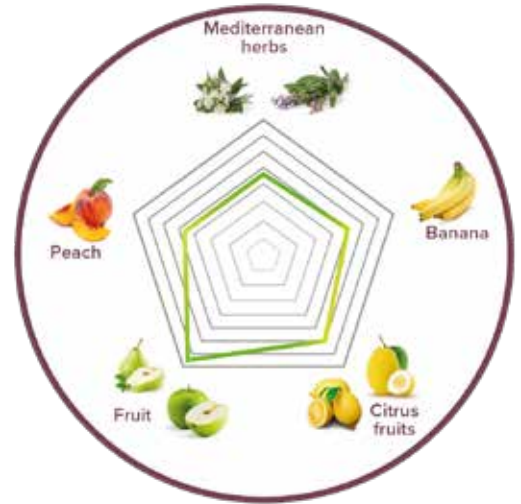


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Prosecco Precursors

Fermoplus PyrOff

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



Usage: add after pectolytic enzymes have finished their activity and pyrazines have been released

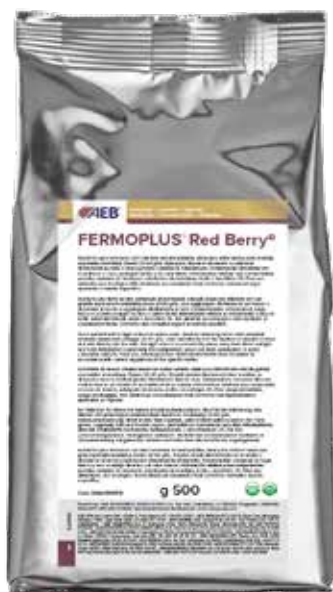
Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg and 20 Kg bags
TTB 27 CFR § 24.246

Fermoplus Red Berry

Fermoplus Red Berry is formulated to enhance the full expression of esters, which are reminiscent of red fruit in red wine. It is ideal for young reds like Gamay from carbonic maceration, lively Bordeaux blend, Pinot Noir, Petite Sirah, and all reds to be consumed young and fresh.

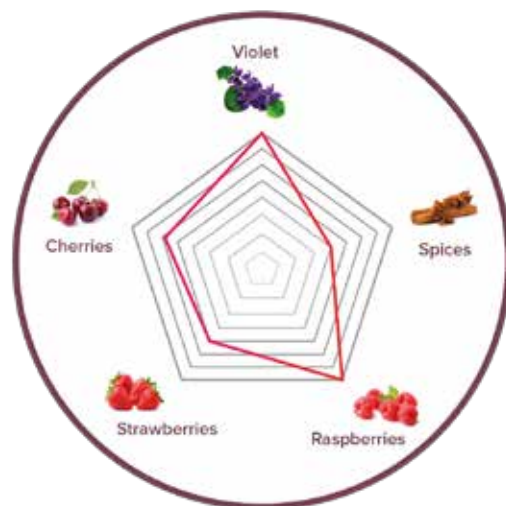


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Available: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Red Berry Precursors

Fermoplus Rosé

Fermoplus Rosé is a nutrient based on yeast derivatives that brings esters reminiscent of roses, red fruit, and wild berries into the fermentation precursors. It is suitable for fermenting thiolic and amylic rosé, known to have a lighter color and a more delicate bouquet.

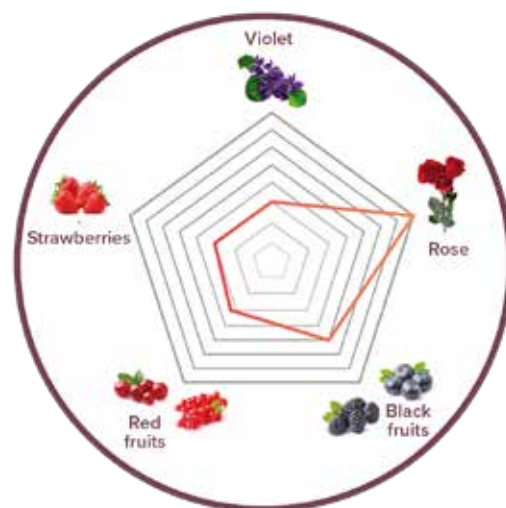


Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Rosé Precursors

Fermoplus Spicy Fruit

Fermoplus Spicy Fruit is a yeast derived nutrient, rich in amino acids that in other than helping the yeast ferment, it brings into the media precursors which will boost cleaner, earthy aromatics typical of varieties like Pinot Noir, Malbec, Syrah, Durif, or Nebbiolo.



Usage: dissolve in must or wine and add to tank after having adjusted the YAN content with DAP based nutrients.

Dosage: 250-500 ppm or 2-4 lbs/1,000 gallons.

Storage: cool dry place, away from direct sunlight and heat.

Available: 5 Kg bags
TTB 27 CFR § 24.246



Graph: Fermoplus Spicy Fruit Precursors

Fermoplus Energy Glu 3.0

Fermoplus Energy Glu 3.0 is optimized for low additions. It is a yeast rehydration nutrient, rich in micro elements and glutathione. Its original formula has been further enriched with naturally derived amino acids, sterols and vitamins to increase yeast activity, multiplication rate and therefore biomass formation.



Fermoplus Energy Glu 3.0 includes glutathione to reduce cell aging due to free radicals that may occur during the oxygenation, normally forced during rehydration. It is also ideal for restarting stuck fermentations or accelerating sluggish ones.

Dosage: 1:4 compared to yeast inoculum, that is, 200 ppm of yeast will need 50 ppm of Fermoplus Energy Glu 3.0.

Storage: cool dry place, away from direct sunlight and heat

Available: 500 gram packets and 20 kg bags
TTB 27 CFR § 24.246



Rosé technology: amylic, thiolic and fruity

Amylic, thiolic, and fruity rosé winemaking, can be perfected in many ways. One thing that is important to check, is the presence of phenolic acids. These compounds, in fact, by binding tartaric acid, form hydroxycinnamic acids, which, interact with the metabolism of oenological yeasts having a cinnamate-decarboxylase activity (POF +), and generate volatile phenols responsible for unpleasant odors. Hydroxycinnamic acids are among the first substances to be oxidized by free radicals that generate quinones responsible for the inhibition of aromas due to thiols binding and browning, giving the wine orange or brown hues.

To avoid these problems, phenolic fining must be carried out after pressing, using protein adjuvants such as animal or vegetable gelatins (Ve-Gel and Gelsol). Another solution for counteracting the risk of olfactory defects is using POF-negative yeasts. Our technologies can make a difference in the production of the three main styles of rosé wines: rosé with an amylic aroma, thiolic, spicy rosé, and fruity rosé.

Rosé Style	Characteristics
Amylic	Pale color, light body, freshness, matched by amylic aromas such as cotton candy and banana
Thiolic	Light pink color, of medium flavor and with pleasant notes of citrus, exotic and white pulp fruits
Fruity	Rounder, more structured taste and a very intense pink color, characterized by aromas of strawberries, raspberries and rose petals

Chart: Different kinds of Rosé requested by the market

Rosé with Amylic Aromas

The rosé with the amylic aroma is characterized by its pale color, light body, and freshness, matched by amylic aromas such as cotton candy and banana, and usually made with grapes picked early in order to preserve acidity. The grapes are subjected to a rapid direct pressing with little color extracted. For fermentation, we recommend low temperatures, around 14-16°C/57-61 °F, which favor the production of esters such as isoamyl acetate, hexyl acetate, and phenylethyl acetate. We recommend Fermol Cryofruit as yeast and Fermoplus Intégrateur 20 kd 2.0 or Fermoplus Rosé as nutrients for this technology.

Thiolic and Spicy Rosé

Thiolic and spicy rosé has a light pink color, of medium flavor and with pleasant notes of citrus, exotic and white pulp fruits. Its aromas are related to glycosylated terpenes and thiolic precursors. For its production, grapes are picked ripe and then subjected to a crucial cold maceration in the press, which allows the release of varietal aromatic precursors. In this case, the contact time of the skins with the must is between 2 to 6 hours, depending on the grape variety, and the temperature is maintained between 10 and 14°C to avoid excessive color extraction.

The fermentation of a thiolic and spicy rosé wine is conducted at temperatures of 16-18°C/61-64 °F, during this phase it is important to release the thiolic precursors and bound terpenes. For this winemaking objective, we offer yeast strains selected for enhancing the aromatic precursors through specific lyasic and glycosidic activity. Fermol Red Bouquet, Fermol PMD 53, Fermol Tropical and Fermol Lime feature this enzymatic activity that makes it possible to release the odorless precursors locked in the grapes. For nutrition we recommend the use of Fermoplus Tropical, Fermoplus Sauvignon and Fermoplus Rosé immediately after the start of the alcoholic fermentation, to enhance the natural varietal notes.

Fruity Rosé

Fruity rosé are wines with a rounder, more structured taste and a very intense pink color. They are characterized by aromas of strawberries, raspberries and rose petals. For these wines, grapes are picked with more advanced ripeness in order to obtain the right aromatic evolution reminiscent of berries. Normally, these wines are obtained through a “bleeding technique”, with a portion of the juice removed during the maceration of red wines and used as rosé. This technique allows for more polyphenols extraction and gives to the product characteristics similar to red wines, with aromas that are sweeter and less fresh than the other two wines described above.

The juice before it is removed, generally, remains from 2-48 hours on the skins, at a temperature around 16°-18°C. In this phase, it is particularly important to use extraction enzymes in order to facilitate juice extraction, increasing its yield and making it possible to optimize the release of the aromatic precursors present in the skin. In this regard, in our range dedicated to rosés, we provide enzymatic preparations such as Endozym Cultivar and Endozym Cat-0, which improve yields of precursors and can shorten the pressing cycles. Following the bleeding off the juice, the juice needs to be clarified at around 100-200 NTUs, to improve clarity and reduce its content of phenolic compounds. Rosé wines with a fruity style are vinified at higher temperatures, 20-25°C/ 68-77°F in order to obtain a greater production of aromatic notes reminiscent of berries. To increase this aromatic evolution, we recommend our Fermol PB 2033 and Fermol Red Fruit yeasts. Strains particularly suitable for the production of rosé wines, able to ferment in a wide range of temperatures and enhance the natural floral and fruity aromas, especially those of berries and small red fruits.

Our nutrients, Fermoplus Spicy Fruit and Fermoplus Rosé are ideal in combination with our active dry yeasts. It is important to release the thiolic precursors and bound terpenes. For this winemaking objective, we offer yeast strains selected for enhancing the aromatic precursors through specific lyase and glycosidic activity. Fermol Red Bouquet, Fermol PMD 53, Fermol Tropical and Fermol Lime feature this enzymatic activity that makes it possible to release the odorless precursors locked in the grapes. For nutrition, we recommend the use of Fermoplus Tropical, Fermoplus Sauvignon and Fermoplus Rosé immediately after the start of the alcoholic fermentation, to enhance the natural varietal notes.

Preserving Rosé

Once fermentation is finished, it is essential to protect the wine from any alterations, such as the early reduction of the aromatic character, the reduction of freshness and the onset of brown compounds responsible for yellowing. Our rosé range is specifically designed to protect wines from these issues. In order to remove oxidized and potentially oxidizable polyphenols from the wine, we recommend effective animal-derived gelatins such as Gelsol or vegetable protein preparations like Ve-Gel. We also have a specific product to protect the wine from oxidation and to ensure its stabilization during every phase: Elevage Glu, rich in Glutathione, tannins with antioxidant action such as Gallovin and Protan AC, and complex products with antioxidant function based on ascorbic acid such as Aromax B4, providing a reliable solution for your wine preservation needs.

A stylized illustration of a young woman with dark skin and voluminous curly hair, wearing a white lab coat over a maroon shirt. She is in a laboratory setting, pouring a yellow liquid from a white beaker into a large glass beaker. The large beaker already contains a green liquid with yellow bubbles rising from it. In the background, there are shelves with various bottles of colored liquids (blue, purple, green) and laboratory equipment. The overall color palette is muted, with greens, blues, and greys, accented by the yellow of the liquid being poured.

CHAPTER 3

MALOLACT BACTERIA

Malolactic fermentation (MLF) is a secondary fermentation process in winemaking, where malic acid, naturally present in grape must or wine, is converted into the softer lactic acid and carbon dioxide. This fermentation is typically carried out by lactic acid bacteria, which are primarily strains of *Oenococcus oeni*.

Purpose: MLF serves several purposes in winemaking. It reduces the total acidity of the wine, making it smoother and less tart. It can also contribute to the wine's complexity by producing various flavor compounds such as diacetyl and other buttery or creamy notes. Additionally, MLF can stabilize the wine by reducing the risk of microbial spoilage.

Timing: the timing of malolactic fermentation is a crucial decision in the winemaking process. It usually occurs after the primary alcoholic fermentation, although it can sometimes overlap. With their expert knowledge and experience, winemakers often choose to inoculate the wine with specific malolactic cultures to ensure a controlled and predictable fermentation process.

Conditions: Malolact cultures typically occur in warmer temperatures, ideally, around 18°C/65°F although, they can also occur at lower temperatures.

Duration: the duration of malolactic fermentation can vary depending on various factors such as temperature, pH, and the health of the bacterial culture. It usually takes a few weeks to a few months to complete.

Malic acid reduction: during MLF, malic acid is converted into lactic acid and carbon dioxide. This process decreases total acidity, and correspondingly increases pH, thus contributing to the wine's overall sensory profile.

Impact on wine: MLF is a transformative process that can significantly enhance the sensory characteristics of the wine. Wines that undergo MLF often emerge with the perception of less acidity, a smoother mouthfeel, and an enhanced complexity due to the formation of new aromas and flavor compounds. Thereby, creating a truly unique and exciting final product.

Control and monitoring: winemakers carefully monitor and control MLF to ensure it proceeds smoothly and does not result in off-flavors or spoilage. Factors such as sulfur dioxide levels, temperature, and nutrient availability are managed to support a healthy fermentation process. Overall, malolactic fermentation is a vital winemaking technique to enhance the sensory qualities and stability of many wines, particularly those intended for aging or with high acidity levels.

For almost 30 years, AEB has been developing cultures of bacteria effective in carrying out the malolactic fermentation of wines.

Malolact Rapid

Malolact Rapid is a new *Oenococcus oeni* culture in a high-performance, freeze-dried form. Decades of research into the best biomass production techniques have resulted in the nutrients and protective substances applied in bioreactors used at AEB labs, to obtain a vigorous culture that is resistant to fermentation stress.

It is ideal for both co-inoculation and post primary fermentation inoculation, where it increases finesse, complexity and balance, leading to wines with an open, fresh and fruity bouquet. On the palate, the sweetness of the lactic acid attenuates tannin astringency in red wines to ensure a high-quality end product.

Tolerance: 15% alcohol, pH > 3.15.

Ideal temperature range: 18°-24°C (64-75 °F).

Dosage: it comes in pre-dosed packets for 2.5 hL, 25 hL, 250 hL, 1000 hL (66 gal, 660 gal, 6,600 gal, 26,400 gallons) of wine.

Usage: take Malolact Rapid out of the freezer 30 minutes before use and add to the tank.



Malolact Acclimatée 4R

Malolact Acclimatée 4R is ideal for big red wines and harsh MLF conditions. The selection has mostly focused on having a strain that is not only resistant to harsh conditions, but also to high levels of tannin (TPI 80).

Tolerance: 14.5% alcohol, pH 3.2.

Dosage: it comes in pre-dosed packets for 2.5 hL, 25 hL, 250 hL, and 1000 hL (66 gal, 660 gal, 6,600 gal, 26,400 gallons) of wine.

Usage: remove Malolact Acclimatée 4R from the freezer 30 minutes before use. It works as a direct add.

Storage: 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.



Co-inoculation Yeast/Bacteria

Co-inoculation of yeast and bacteria in grape must is a crucial step in winemaking. Bacteria, when inoculated in wine at the end of alcoholic fermentation, face challenging conditions such as high ethanol content and low pH, which can threaten their survival. However, when inoculated in grape must, the bacteria have the opportunity to adapt gradually to ethanol before it becomes toxic for the cell. This process significantly facilitates ML. Despite the benefits, there is still some skepticism about co-inoculation due to the risk of increased VA and competition with the yeast. It's important to note that Lactic acid bacteria have limited biosynthetic ability and therefore require pre-formed amino-acids and B-vitamins. During co-inoculation, providing amino-acids to the yeast for optimizing biomass formation is crucial. An ideal timing for this would be during yeast rehydration, using Fermoplus Energy Glu 3.0 and during fermentation using DAP Free Fermoplus.

Tips to ensure successful co-inoculation:

- We recommend waiting for the end of the yeast lag phase before adding the Malolact of choice.
- Temperature control is crucial and should never reach 30°C/86°F.
- Regarding sulfur dioxide, 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 sulfur dioxide level, <50 ppm or >50 ppm, we recommend co-inoculation after 24-48 hours, respectively.

How to increase buttery (diacetyl) flavor

Malolact 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 depends on the metabolism of citric acid, and the fact that Malolact strains convert citric acid into diacetyl under partially aerobic conditions. First degraded to acetic acid, citric 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 the 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 sulfur dioxide. If diacetyl is desired it is better to wait a few days after completions of MLF before sulfur dioxide 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 surlies, without the risk of losing diacetyl.
- If diacetyl is desired do not co-inoculate ML with yeast
- Faster ML produces less diacetyl. For higher diacetyl play with temperature and pH to ensure Malolactic fermentation lasts about 2 weeks.

How to Save Money on Malolactic Bacteria by Propagation:

Direct add bacteria can be added directly, pouring the acclimated bag into the wine or propagating it to increase population and efficiency.

Procedure:

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 AF.
4. Adjust pH to 3.5-4 and inoculate with the malolactic bacteria of choice.
5. Maintain a constant temperature of 24°C /75°F for 24 hours.
6. The next day, that portion of wine will have a much more aggressive population to quickly start the MLF process in the rest of the tank.

Fermoplus Malolactique AF

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 rebalances 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. Fermoplus Malolactique AF is naturally rich in Arginine, which raises the production of ATP (Energy).

Usage: dissolve the dose in wine to be treated and the dose of malolactic bacteria.

Dosage: 50-200 ppm (5-20 grams/hL or 0.5-1.5 lb/1000 gallons).

A higher dosage is for when used in co-inoculation early on.

Storage: Fermoplus Malolactique AF is stable at room temperature for at least two years.

Available: 500 grams packs and 5 Kg bag



CHAPTER 4

ENZYMES FOR WINEMAKING

Enzymes play a crucial role in the winemaking process, influencing various stages, from grape processing to the final clarification of wine. These biological catalysts enhance flavor, color extraction, and clarity and facilitate filtration, among other benefits. They are derived from non-GMO fungi, like *Aspergillus niger* and *Trichoderma harzanum*. Here is a quick overview of some key enzymes and their functions in winemaking:

- **Pectinases:** perhaps the most widely used enzymes in winemaking, pectinases break down pectin, a polysaccharide found in grape cell walls. This action helps in most fining, increases yield, and improves filtration by reducing viscosity and preventing haze formation in the final product.
- **Glucosidases:** these enzymes can hydrolyze glycosidic bonds, releasing aromatic compounds bound in a non-volatile form in grapes. This enhances the aroma and flavor complexity of wine.
- **Cellulases and Hemicellulases:** used to break down cellulose and hemicellulose in grape skins, these enzymes can improve the extraction of color and phenolic compounds, particularly in red winemaking.
- **Amylases:** these enzymes can break down starches that might be present in the must. They are mostly used in cider.
- **Beta-glucanases:** are useful in breaking down glucans from fungal cell walls, particularly in grapes affected by *Botrytis cinerea* (noble rot). These enzymes can improve filtration by reducing the wine's viscosity.

Pectinases for winemaking

Endozym Active

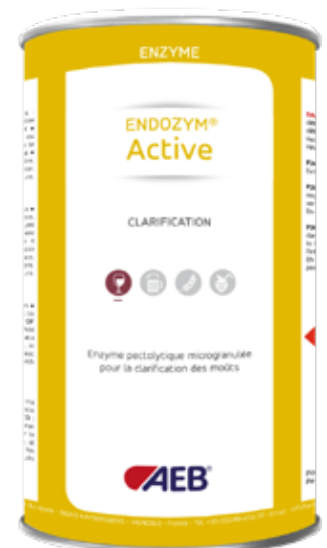
Endozyme Active is a granular pectinase enzyme is to be used to break down pectins before settling or flotation. It promotes the hydrolysis of the pectic chains, facilitating juice drainage from pomace and yielding higher free-run juice due to its pectolytic and polygalacturonase action. Clarification of musts and wines is significantly accelerated, resulting in more compact lees. A cleaner must results in cleaner aromas and less unstable proteins, making it easier to filter.

Usage: dissolve directly in 20-30 parts of non-sulfurized must or demineralized water and add to the must or directly onto the grapes. Lower temperatures reduce the activity of Endozym Active. If the grapes are not too rich in phenolics, the product can be added directly into the receiving line. Thus, allowing for good contact time with the must before refrigeration. Precaution must be taken to avoid contact between the enzyme and high dosage levels of sulfur dioxide or bentonite.

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

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.

Available: 500 gram vacuum sealed cans
TTB 27 CFR § 24.246



Endozym Ice

Endozym Ice is an extra rapid, liquid pectinase enzyme for must settling that, due to its strength, also works 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 sulfur dioxide .

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

Dosage: 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.

Available: 1 Kg plastic bottles

TTB 27 CFR § 24.246



Endozym ICS 10 Éclair

Endozym ICS 10 Éclair, is a high concentration liquid pectinase enzyme. It contains 35,000 pectin lyase units per gram, making its clarification activity significantly greater than most enzymes on 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.

Usage: 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 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.

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

Available: 250 ml and 1 Kg plastic bottles

TTB 27 CFR § 24.246



Endozym E-Flot

Endozyme E-Flot is a 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 must is not below 55°F/12°C and thoroughly depectinized before it hits the flotation unit. Endozym E-Flot 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.

Usage: 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 E-Flot 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 sulfur dioxide 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.

Storage: Endozym E-Flot should be stored at 5°C/40°F for a period not longer than 24 months.



Available: 10 Kg containers

TTB 27 CFR § 24.246



*Use with AEB E-Flot range models
contact us for more information*

Endozym Micro

Endozym Micro is a concentrated liquid pectinase enzyme. It is 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.

Usage: 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 sulfur dioxide or bentonite. Lower temperatures reduce the activity of Endozym Micro.

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

Storage: Endozym Micro should be stored at 5°C/40°F for a period not longer than 24 months.

Available: 10 Kg and 25 Kg containers

TTB 27 CFR § 24.246



Endozym Muscat

Endozym Muscat is a 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 zone’. These are ramifications of the polygalacturonic acid molecule (pectin) that are much harder to process than regular ones. Secondary activities such as Arabinase 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.

Usage: 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 sulfur dioxide or bentonite.

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

Storage: Endozym Muscat is stable at room temperature for at least two years.

Available: 500 gram vacuum-sealed cans

TTB 27 CFR § 24.246



Cold maceration of white grapes

Cold macerating enzymes work most effectively at lower temperatures, typically between 10°C-15°C (50°F-59°F). At these temperatures, they help to enhance the extraction of desirable compounds while minimizing unwanted harsh phenolics. The enzymatic activities used during the pellicular maceration phase (PG, PL, and CMC) release the aromatic substances and bouquet precursors, which generally remain trapped in the pomace. They also facilitate the release of the juice and increase yields, avoiding long cycles and high PSIs in the press. Also, due to the presence of a protective lipid layer on their surface, enzymes do not affect grape seeds, which are typically rich in bitter phenolics. The aromatic potential of grapes, localized in the skin, is represented by free and volatile odoriferous substances. These are easily perceivable from the first stages of vinification and by odorless aroma precursors, which can contribute to the wine bouquet.

Endozym Cat-0

Endozyme Cat-0 is an enzyme that has the double function of increasing the extraction of free aromatic compounds and aroma precursors and extracting the lowest quantity of oxidizable polyphenols. This makes it ideal for cold maceration of white grapes. The formulation of Endozym Cat-0 has been studied on varieties highly rich in catechins and has shown essential reductions in extraction compared to the control. It includes Arabinase and Polygalacturonase activities, studied in collaboration with the University of Turin, to extract less oxidizable polyphenolic compounds and ensure the best yield and aromatic extraction results.

Usage: a liquid product can be dosed automatically and added directly to the grapes.

Dosage: use from 15-20 ml per ton of grapes to be treated.

Storage: store in its original sealed packaging, away from light, in a cool and dry place free of odors, at a temperature below 20°C/68°F. Do not freeze.

Respect the shelf life indicated on the packaging.

Use quickly after the first opening.

Available: 250 gram net bottles

TTB 27 CFR § 24.246



Endozym Cultivar

Endozyme Cultivar is a granular enzyme for cold maceration of white grapes. It 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 aroma extraction. It also has a very high β -Glucosidase activity to release terpenes from sugars and provides a PL and PG action comparable to enzymes used for must settling and yield.

Usage: dissolve directly in 20-30 parts of non-sulfurized must or demineralized water and add directly onto the grapes going to the press. Cold maceration is generally performed by leaving the crushed grapes at 5-8°C/40-46°F for about 24 hours. These low temperatures reduce the activity of the Endozym Cultivar. The enzyme should be added directly to the truck/gondola or into the receiving line, thus allowing for good contact time before refrigeration. Precaution must be taken to avoid contact between the enzyme and high levels of sulfur dioxide or bentonite.

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

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.

Available: 500 gram vacuum-sealed cans

TTB 27 CFR § 24.246



Color and macerating enzymes



Anthocyanidins are red grape pigments that mainly occur on the grape skin. To dissolve anthocyanins better, and improve tannin extraction from the skin, which contributes to color stability, enzymatic preparations with high hemicellulosic and cellulosic (CMC) enzymatic activities are needed. In fact, if the extraction is not completed, 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 (not in the case of Endozym Velluto, where this extraction is enhanced).

The addition of these enzymes is carried out either directly on the red grapes at the crusher, or at the beginning of maceration, during 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, thereby 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

Endozym ICS 10 Rouge Liquid maceration and color extraction enzyme, it comes in the form of a super concentrated liquid product. This 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.

Usage: 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.

Storage: stored at 5°C/40°F for a period not longer than 24 months.

Available: 250 gram and 1 Kg plastic bottle

TTB 27 CFR § 24.246



Endozym Velluto

The specific formulation of Endozym Velluto, rich in Arabinanase activity, is the result of a research project carried out in collaboration with the University of Torino (Italy) to increase the extraction of polysaccharides from grapes, minimizing oxidizable and bitter polyphenolic compounds. The blend of activities includes pectin lyase, pectin méthylestérase and L-arabinanase.

Usage: liquid product and can be dosed automatically and added directly to the red grapes.

Dosage: use from 1-2 g/hL or 10-20 grams/ton of product to be treated.

Storage: store in their original sealed packaging, away from light, in a cool, dry place at a temperature below 20°C. Do not freeze. Consume preferably by the date indicated on the package. Once opened, the product should be stored tightly closed in the refrigerator and consumed as soon as possible. The enzyme activity within the product is stabilized. If a visual analysis does not show significant macroscopic signs of hygienic alteration (mold colonies, clouding, effervescence, swelling), the opened product can be used until exhausted without waste. If in doubt, please get in touch with AEB's technical service.

Available: 250 gram bottles

TTB 27 CFR § 24.246



Enzyme for thermo vinification

Endozym TMO

Endozym TMO is an enzyme for thermo vinification it a liquid pools of enzymatic activities to clarify heat extracted musts. It is characterized by secondary solid activities and is 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 more complex than usual to degrade.

Endozym TMO displays an optimal concentration in pectolytic units and is ideal for removing clogging polysaccharides. This enzyme degrades them, resulting in a marked improvement of must clarity.

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

Dosage: from 20-40 ppm.

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.

Product can be used until exhausted without waste.

If in doubt, please get in touch with AEB's technical service.

Available: 250 gram bottles

TTB 27 CFR § 24.246



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 an accessible 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 Arôme Plus or Fermol Sauvignon) and non-*Saccharomyces* yeasts (Primaflora, Levulia Torula).

Another compound 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 help reduce the viscosity of musts and wines caused by microbial contamination.

Endozym Antibotrytis

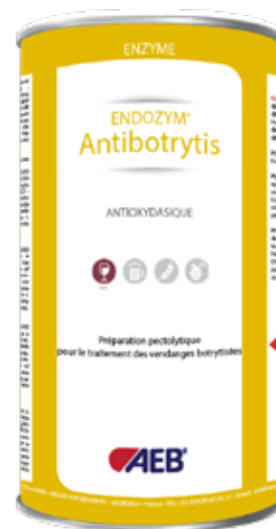
Endozym Antibotrytis eliminates laccase and prevents plugging. It is a purified enzymatic preparation, with activities useful to solve problems deriving from the presence of *Botrytis Cinerea* in the must. Endozym Antibotrytis indirectly acts towards polyphenol oxidases (tyrosinase-laccase) present in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

Usage: dilute directly in 20-30 parts of non-sulfurized or demineralized 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 higher dosages.

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.

Available: 500 gram vacuum-sealed cans



Endozym β -Split

Endozym β -Split is a granulated beta-glucosidase specific for aroma extraction. This is to be added to the fermentation of red, rosé, and white musts, either midway through the fermentation or to the finished wines before bentonite addition. It is a beta-glucosidase for aroma enhancement developed in a solid-phase media and, therefore, expresses many induced secondary activities. Thanks to these, Endozym β -Split can cleave aromatics from the beta-glucosides and the pentoses nonfermentable sugars.

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

Dosage: 20-50 ppm (1/3-1/2 lb/1,000 gallons) depending on contact time, temperature and sulfur dioxide 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 must be taken to avoid the contact between the enzyme and high dosage levels of sulfur dioxide or bentonite. In white and rosé wines, AEB Bentogran should be used to neutralize the enzyme when the desired aromatic profile is achieved.

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.

Available: 500 gram vacuum-sealed cans



Endozym Glucapec

Enzyme Glucopec is an enzyme used 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 treating wines rich in glucans and pectins derived from botrytis-infected grapes and yeast cell walls.

Botrytis cinerea-affected grapes are rich in glucans, a polysaccharide that is 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.

Endozym Glucapec is also used to enhance the wines kept on their lees qualitatively. In fact, this treatment accelerates the processes of cell-autolysis of the yeast. Autolysis brings in solution amino acids, nucleic acids, and mannoproteins, improving the mid-palate, the redox potential, the aromatics, and even the tartaric stability of wines. Ideally, this enzyme should be used between 60-78°F (16-24°C) and never used with bentonite.

Usage: dilute in 20-30 parts wine with low SO₂ or de-mineralized water. Add directly to the wine. The addition must be carried out in finished wines, 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).

Storage: stable at room temperature (less than 75°F) for 3 years.

Available: 500 gram vacuum-sealed cans



Endozym Thiol

Endozym Liquid Thiol is a liquid carbon-sulfur lyase that favors the hydrolysis of the thiol precursors and enhances 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 box tree and 3-MH (3-mercaptohexan-1-ol), reminiscent of grapefruit.

Usage: add to the fermenting tank midway through fermentation. If this risk occurs, use Elevage Glu to protect the aromatic from oxidation.

Dosage: 20-40 ml (23-46 g) per ton of grape, or 20-40 ppm on 1/3 lb/1,000 Gallons must be treated depending on time, temperature and sulfur dioxide content.

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

Available: 1 Kg bottles



Enzymes for starch breakdown, including clarification of apple juices for cider making

Endozym Alphamyl

Endozym Alphamyl is a α -amylase enzyme for the clarification of cider. It is 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 facilitates the clarification process before fermentation. It avoids possible starch-related haze and facilitates ultra-filtration.

Usage: dilute the product 5:10 times in deionized water and mix well into the media. Contact time varies from 1 hour at 45°F/113°C. To 6 hours at 10°C/50°F. Fungal 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 their maturity (early-season fruit usually has more starch, so it requires more enzyme). Use 2-6 ml/100 kg of apples at 45-50°C. Contact time should be 60 minutes. If heat isn't available, use 20 ml/100 and increase contact time.

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

Available: 1 Kg bottles and 25 Kg containers



Endozym Pectofruit PR

Endozym Pectofruit PR is a cellulase that used to increase yield and to help clarify cider and perry. It is an ultra-concentrated enzymatic preparation, prepared explicitly for treating macerated fruits before pressing. AEB realized this pectolytic enzyme with an exceptionally high pectin lyase (PL) was responsible for the total degradation of the fruit structure before pressing. Also, secondary activities like arabanase, cellulase, and hemicellulase work specifically to increase yield and to help clarify.

Advantages: better fruit extraction and viscosity improvement, yield increase during pressing, effective action on scraping or mashing even with a limited contact time. Fruits, where Endozym Pectofruit PR can be used with effectiveness other than apples, include currant, raspberries, blackberries, and summer fruits, such as peach, plum, and apricot.

Usage: dilute the product 5:10 times in deionized water and mix well into the media. Contact time varies from 30 minutes at 45°C/113°F to 2-3 hours at 10°C/50°F. It is usually used before pressing.

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

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

Available: 1 Kg bottles and 25 Kg container



CHAPTER 5



POLYSACCHARIDES

Gum arabic and yeast derived peptides

In these times, consumers prefer wines with a smooth mid-palate and some sweetness to it. Adding sugar in the form of concentrate has been the solution for many years. However, sugar comes with a high caloric content, and when this data will be shared through the nutritional information on the label, some wines may scare away certain consumers. In addition, leaving residual sugars in a finished wine is often a risk that requires products like dimethyl dicarbonate or sorbate to be added to prevent spoilage in the bottle.

Specific natural polysaccharides can be added to the wine to give smoothness and a sweet sensation without having to leave or add sugars. These products can be derived from the yeast cell walls (mannoproteins and peptides) or from Acacia Seyal and Senegal trees (gum Arabic).

Acacia derived products

Gum Arabic is a natural sap derived from Acacia trees located in the Sub-Saharan area of Africa, where the growing conditions yield the perfect balance of non-fermentable sugars. Gum Arabic can be dextrorotary or levorotary, and this changes a lot of the characteristics of the product:

- Dextrorotatory gum is more accessible to filter, has better stabilization of tartrates, and a more suitable viscosity.
- Levorotatory gum is more viscous, and has better stabilization for color.

The regulations finalized in the US authorize the use of acacia for clarifying and stabilizing wine at a use rate of 16 pounds per 1,000 gallons of wine (1.9 g/L), or 0.19%, within the 1% use rate limitation outlined in the FDA regulations for these purposes.

ARABINOL line

Arabinol

Arabinol is a dextrorotatory gum that brings smoothness with a good compromise between viscosity and filterability. It helps with tartaric stability and inhibits metal and protein cases. When added to wines, Arabinol slows down the aggregation of crystals of tartrates. It also diminishes the perception of astringency and bitter tannins, adding persistency. Contains 0.3-0.5% sulfur dioxide.

Add to the finished wine after all the fining has been completed.

Usage: mix well into ten parts of wine or must and add to the tank, ensuring it is well homogenized.

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

Dosage: 200 - 1500 ppm.

Available: 1 Kg bottles, 10 Kg and 25 Kg containers and 230 Kg drums
TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



Arabinol Arôme

Arabinol Arôme is a blend between dextrorotatory and levorotatory gums, which preserve the aromatic components of the wine. It inhibits the precipitation of tartrates, and in young reds, and it is also ideal for stabilizing red pigments. Contains 0.3-0.5% sulfur dioxide. Add to the finished wine after all the fining has been completed.

Usage: mix well into ten parts of wine or must and add to the tank, ensuring it is well homogenized.

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

Dosage: 200-2000 ppm.

Available: 1 Kg bottles, 10 Kg and 25 Kg containers and 230 Kg drums
TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



Arabinol Bio D and Bio L

Arabinol Bio D and L respectively are dextrorotatory and levorotatory certified organic, granular gums. They do not contain sulfur dioxide, but will require more time to solubilize and homogenize in the wine. Solubilize in wine or water in a separate tub before addition, and wait up to two weeks before filtering.

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

Dosage: 100 - 300 ppm.

Available: 1 Kg packs

TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



Arabinol Dolce

Arabinol Dolce is the best alternative to a concentrate addition in wines. It is a dextrorotatory gum, where the processing has been engineered with the goal of giving less boldness, but more smoothness and length. In high alcohol wines it reduces the “heat”. Contains 0.2-0.35% sulfur dioxide.

Usage: add to the finished wine after all the fining has been completed. Mix well into 10 parts of wine or must and add to the tank making sure is well homogenized.

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

Dosage: 200 - 1500 ppm.

Available: 20 Kg containers

TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



Arabinol HC

Arabinol HC is a certified Dextrorotatory gum solubilized at high concentrations (33%) and made with a selected raw material, which brings a higher level of viscosity. It protects from any precipitation occurring due to wine instabilities. Contains 0.3-0.5% sulfur dioxide. Add to the finished wine after all the fining has been completed.

Usage: mix well into 10 parts of wine or must and add to the tank making sure is well homogenized.

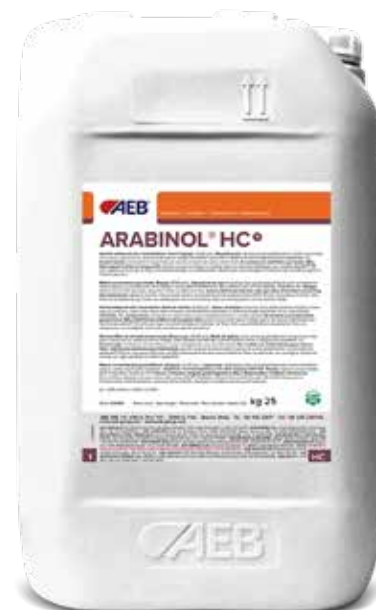
Storage: it can be kept for two years in the original sealed packaging, away from light, and in a cool, dry, odor-free place.

Dosage: 200-1500ppm.

Available: 1 Kg bottles, 25 Kg containers

TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



Arabinol Super Rouge

Arabinol Super Rouge is a levorotatory gum high in viscosity and has specific characteristic for stabilizing red color. It contains 0.3-0.5% sulfur dioxide. Add it to the finished wine after all the fining has been completed.

Usage: mix well into 10 parts of wine or must and add to the tank making sure is well homogenized.

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

Dosage: 200-1400 ppm.

Available: 25 Kg containers

TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.





Yeast derived polysaccharides

The polysaccharides of oenological interest in winemaking comes from the degradation of yeast cell walls. One of the main objectives of “*élevage sur lies*” is to have an exchange with the medium. As a consequence of the various interactions, the mannoproteins leave the wall and influence the wine in several ways. These molecules can bring several benefits to the wine including:

- **Texture and mouthfeel:** mannoproteins contribute to the texture and mouthfeel of the wine. They can enhance the body and richness of the wine, providing a smoother and rounder mouthfeel.
- **Antioxidant activity:** it has been demonstrated that AEB products based on yeast derivatives can substitute SO_2 as an antioxidant. They contain reducing molecules like GSH (Glutathione) and lipid compounds with anti-radical activity.
- **Color stability:** mannoproteins may contribute to the color stability of red wines. Their interaction with polyphenolic compounds can influence the color intensity and stability over time. Moreover, it has been shown that yeast-derived products can adsorb phenolic compounds and browning products in white wines.
- **Aroma binding:** mannoproteins can bind with certain aroma compounds, contributing to the aromatic complexity of the wine. This interaction can help retain and release specific aromas, influencing the sensory profile of the wine.
- **Flavor integration:** mannoproteins may play a role in integrating and harmonizing flavors in the wine. Their interactions with other wine components can contribute to a more balanced and integrated flavor profile.
- **Tartaric stabilization:** mannoproteins with specific molecular weights play a significant role in inhibiting potassium bitartrate precipitation in wine, preventing the formation of unwanted crystals.
- **Protein stabilization:** they help improve the protein stability of white wines.
- **Microbial protection:** mannoproteins can interact with and adsorb certain compounds, preventing microbial spoilage and contributing to the microbial stability of the wine.

The extent to which these activities will be enhanced will depend upon the composition of the blend in terms of different forms of yeast derivatives (cell walls, inactivated yeast, lysate, autolyzed, mannoproteins).

AEB line

The following AEB products are all made out of autolyzed yeast rich in peptides, mannoproteins and anti-oxidant amino acids. They all increase the positive effect of the sur-lie, making wines smoother and more harmonious. At the same time preventing the formation of off-odors mercaptans and enhancing the bouquet of the varietal.

Bâtonnage Plus Élevage

Bâtonnage Plus Élevage is a yeast derivative rich in antioxidants and polysaccharides that will increase the volume of the wine, while optimizing the redox potential to preserve it from oxidation.

Usage: the product is highly hygroscopic, so to dissolve it, leave it in a container with 10 parts of wine or warm water and wait one hour before mixing. Add to the fermenting wine with a venturi or pump-over when in solution.

Dosage: 100-300 ppm or 1-2.5 lb/1,000 gallons, depending on the wine.

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

Available: 5 Kg bags

TTB 27 CFR § 24.246



Bâtonnage Plus Structure

Bâtonnage Plus Structure integrates the smoothness of the yeast derived mannoproteins with the aroma and structure of oak tannins and levorotatory gum Arabic. It enhances the natural aromas of chocolate, and it can also harmonize the aroma of wines high in methoxypyrazines.

Usage: the product is highly hygroscopic, so to dissolve it, leave it in a container with 10 parts of wine or warm water and wait one hour before mixing. Add to the fermenting red wine with a venturi or pump-over when in solution.

Dosage: 100-300 ppm or 1-2.5 lb/1,000 gallons, depending on the wine.

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

Available: 5 Kg bags

TTB 27 CFR § 24.246



Bâtonnage Plus Texture

Bâtonnage Plus Texture is used in early fermentation, to help the yeast enhance the natural varietal of red, white, and rosé wines by providing amino acids. It will also add to the volume and mid-palate of the wine.

Usage: the product is highly hygroscopic, so to dissolve it, leave it in a container with 10 parts of wine or warm water and wait one hour before mixing. Add to the fermenting wine with a venturi or pump-over when in solution.

Dosage: 100-300 ppm or 1-2.5 lb/1,000 gallons, depending on the wine.

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

Available: 20 Kg bags

TTB 27 CFR § 24.246



Elevage Glu

Elevage Glu is rich in GSH, which plays a crucial role in protecting white and rosé wines from browning and pinking. It also enhances the natural complexity of the wine by adding to mouthfeel and protecting the aromatics.

Usage: the product is highly hygroscopic, so to dissolve it, leave it in a container with 10 parts of wine or warm water and wait one hour before mixing. It should be added toward the end of the fermentation when the wine is unprotected by the carbon dioxide sitting in the headspace.

Dosage: 100-300 ppm or 1-2.5 lb/1,000 gallons, depending on the wine.

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

Available: 500 gram and 5 Kg bags

TTB 27 CFR § 24.246



Super-Mann

Super-Mann is pure mannoprotein extracted from the hulls of *Saccharomyces cerevisiae*. It is completely soluble and adds to the wine's stability.

Usage: the product is highly hygroscopic, so to dissolve it, leave it in a container with 10 parts of wine or warm water and wait one hour before mixing. Once in solution, add it to the finished wine with a venturi or pump-over.

Dosage: 100-300 ppm or 1-2.5 lb/1,000 gallons, depending on the wine.

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

Available: 500 gram packets

TTB 27 CFR § 24.246



TTB approves the use of bakers yeast mannoprotein to stabilize wine from the precipitation of potassium bitartrate crystals at an amount not to exceed 400 mg/L.

Contains product/s that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation.



CHAPTER 6

TANNINS

Tannins are flavonoids, oligomers, or polymers that are highly reactive and interact with other polyphenols or with macromolecules such as proteins. These compounds can be classified as hydrolyzable or condensed. Hydrolyzable tannins are formed by several phenolic acid molecules and are classified as gallotannins and ellagitannins. Condensed tannins are polymers of flavan-3-ols, including procyanidins and prodelphinidines.

Generally speaking, in winemaking, hydrolyzable tannins are solid antioxidants and contribute to the process of color protection by shielding anthocyanins from oxidation and stabilization. This occurs by optimizing the formation of ethanal bridges, which lock the color into flavan-3-ol polymers. Hydrolyzable tannins can be sourced from gallnuts (gallic tannins like AEB Gallovin, have extreme antioxidant activity, and are highly reactive with proteins. Ellagic tannins are sourced from oak, chestnut, and cherry trees and have an antioxidant and aromatic impact.

Condensed tannins come from grapes and certain trees like Quebracho. They are highly reactive to other phenolics and can help stabilize the color by locking it into a polymer that is not affected by sulfur dioxide, oxygen, or pH.

Fermentation tannins: color stabilization

Fermotan and Fermotan Liquid

Fermotan is a line of fermentation tannins formulated according to different needs and varieties. The range of the Fermotan line was developed in collaboration with the University of Torino. Fermotan and Fermotan Liquid are the most traditional line of fermentation tannins composed of 60% proanthocyanidins and 40% ellagic.

It works toward preserving the original content of:

- Color, by locking the unstable monomeric pigment into a stable polymer.
- Tannins, by sacrificing itself with the proteins that would otherwise precipitate with the original polyphenols from the grapes. Fermotan should be added right at the beginning of red fermentation in order to shield the wine from oxidation and to lock the unstable colored pigments.

Usage: mix well into 10 parts of wine or warm water or must and add to the tank during a pump-over.

Dosage Fermotan Powder:

120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 1 Kg packets and 15 Kg bags

Dosage Fermotan Liquid:

200-500 ppm or 1.5-4 lbs/1,000 gallons.

Available: 5 Kg and 25 Kg containers

TTB 27 CFR § 24.246



Fermotan AC

Fermotan AC imparts a chewy and lingering taste. It is the ideal agent for color stabilization, as it brings soft notes to the mouthfeel. It allows for more additions during fermentation without giving bitterness and green notes to the finished wines. Fermotan AC is ideal for the fermentation of grapes that do not reach complete phenolic maturity, as it complements the phenolic deficiencies by adding volume without bitterness.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan AG

Fermotan AG is a formulation ideal for varieties rich in malvidin. It is a particular kind of anthocyanin that is released slowly and best integrated by grape skin-derived tannins, which are a significant component of the Fermotan AG. Grape skin-derived tannins make this product very smooth and efficient. Other components are ellagic tannins from oak as antioxidants, and Quebracho tannins as sacrificial phenolics. It is formulated specifically for Aglianico, Malbec, Zinfandel, Tempranillo, Negroamaro, Nero d'Avola, and Pinotage.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan CB

Fermotan CB is formulated with grape skin and grape seeds tannins to capture and stabilize malvidin pigments. It builds a soft structure, that also works with the varietal tannins to evolve appropriately over time. It completes the formulation of a portion of Quebracho-derived tannins with a “sacrificial” function, that preserves the original tannins from the grapes. Formulated specifically for Cabernet Sauvignon, Merlot, Barbera, Montepulciano, and Teroldego.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan Frutti Rossi

Fermotan Frutti Rossi is a formulation that includes ellagic tannins. It contributes to enhancing black and red fruity notes and stabilizing color. The smooth structure this tannin brings is ideal for those red fermentations, where seed tannins are discarded to minimize bitterness. Fermotan Frutti Rossi brings back a soft backbone that contributes to fruity nuances in the nose and mouth.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan SG

Fermotan SG is formulated for varieties like Pinot Noir and Sangiovese, it is rich in “fragile” di-substituted pigments, such as, cyanidin and peonidin anthocyanins. It contains an essential fraction of hydrolyzable tannins with strong antioxidant power.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan SH

Fermotan SH is specific for varieties with high malvidin, like Syrah, to be stabilized with grape-skin tannins and in need of extra structure from seed-derived phenolics. It also contains Quebracho tannins, which help preserve the original phenolics from the grapes by working as sacrificial tannins. Formulated specifically for varieties like Syrah, Petite Sirah (Durif), and Touriga Nacional.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246

Tanethyl Effe

Tanethyl Effe is an ellagic tannins mixed with seed-derived proanthocyanin with an aldehydic bridge, integrated into the structure, to guarantee high reactivity for polymerization with anthocyanins and other polyphenols. This characteristic makes the proanthocyanidin portion of Tanethyl Effe immediately available, so that the color can be locked and stabilized against the effects of sulfur, pH changes, oxygen, and aging in general. Because of the ellagic tannin fraction, Tanethyl Effe is recommended for red wine fermentation where ellagic tannins can work in synergy with oxygen. This promotes the formation of the ethanal bridges needed for polymerization of color and structure. It is often used in cold soak when alcohol is not present, and ethanal bridges cannot be formed.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 1 Kg bags

TTB 27 CFR § 24.246



Fermentation tannins: whites and problematic grapes

Fermotan Antibotrytis

Fermotan Antibotrytis is formulated to include low molecular weight ellagic and proanthocyanidin tannins, which can stop the oxidative effect of Botrytis-derived polyphenol oxidase (Tyrosinase).

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 5 Kg bags

TTB 27 CFR § 24.246



Fermotan Blanc

Fermotan Blanc is a blend of hydrolyzable tannins from untoasted oak and gallnuts to protect the wine from oxidation and lift the mid-palate.

Usage: make a slurry of Fermotan Blanc in 10 parts of wine or must and add it at the exit of the press to start protecting the must as soon as possible.

Dosage: depending on the variety, 50-200 or 60-240 ppm or 1/2-2 lbs/1,000 gallons.

Available: 1 Kg bags

TTB 27 CFR § 24.246



Gallovin and Gallovin Liquid

Gallic tannins are derived from the core of gallnuts and purified from the external catechins, which can be found in formulations extracted from the whole nut. It is a potent antioxidant that brings little to no color. It has a strong reactivity, combining proteins and polyphenol oxidases like laccase and tyrosinase. That is a recommended solution to protect wines from the damage associated with *Botrytis cinerea*.

Usage: mix well into 10 parts of wine or must and add and add to the receiving conveyer and at racking.

Dosage Powder: 100-250 ppm on the grapes or during pump-over or 100-150 ppm at racking.

Dosage Liquid: 150-400 ppm on the grapes or after must fining, 50-75 ppm at racking.

Available: 500 gram packs and 5 Kg bags (powder) or 25 Kg containers (liquid)
TTB 27 CFR § 24.246



Protan Bio Q

Protan Bio Q is an organic certified proanthocyanidin derived from Quebracho wood. Its characteristics bring to the wine an added protection against oxidation and add a layer of structure, which will help the wine to age better and preserve color.

Usage: mix well into 10 parts of wine or must and add to the tank during a pumpover

Dosage: 120-400 ppm or 1-3 lbs/1,000 gallons.

Available: 500 gram packs
TTB 27 CFR § 24.246



Finishing Tannins

Protan Bois

Protan Bois is a proanthocyanidin tannin derived from Quebracho, which is partially polymerized to act as a structure enhancer without adding any bitterness. Because of its condensed nature, it also works well for stabilizing color and supporting the aging of red wines during long term storage or with microoxygenation.

Usage: mix well into 10 parts of wine or must and add during a pump over or with a Venturi system.

Dosage: 100-300 ppm on the grapes or during pump-over or 100-250 ppm at racking.

Available: 500 gram packets and 5 Kg bags

TTB 27 CFR § 24.246



Protan Fresh

Protan Fresh is a proanthocyanidin that brings back freshness to “tired” wines. It can be used in reds, whites and rosé to keep wines from premature aging.

Usage: mix well into 10 parts of wine or must and add with a Venturi system.

Dosage: 60 ppm/ 0.5 lb per 1,000 gallons on whites.

120-240 ppm/ 1-2 lbs per 1,000 gallons on reds.

Available: 1 Kg bags

TTB 27 CFR § 24.246



Protan LXP

Protan LXP is a proanthocyanin extracted from exotic woods including lemon tree and Acacia. It can be used in white wines to add a layer of body, enhance crispness, brighten-up the finish, and increase length. Therefore, enhancing the characteristics of the wine.

Usage: mix well into 10 parts of wine or must and add to the tank during a pumpover.

Dosage: 60-200 ppm or 0.5-1.5 lbs/1,000

Available: 1 Kg bags

TTB 27 CFR § 24.246



Protan Malbec

Protan Malbec is a proanthocyanidin sourced from extra ripe seeds of grapes. It brings the typical nuttiness that is normally extracted from the pips, but without any bitterness or green notes. It can be used in reds when seeds are discarded in maceration since they have not reached the phenolic maturity and when wines show a “donut” structure. In whites, it brings subtle sharpness to add crispness to otherwise dull wines.

Usage: mix well into 10 parts of wine or must and add to the tank with a Venturi system.

Dosage: 30 - 60 ppm 0.25-0.5 lbs per 1,000 Gallons in whites or 200-400 ppm or 1.5- 3 lbs/1,000 gallons in reds.

Available: 500 gram packs

TTB 27 CFR § 24.246



Protan Pépin Oxilink

Protan Pépin Oxilink is a tannin extracted from grape seeds which brings an 'old world' edge to the structure without adding to bitterness. It is ideal for reds meant to age and whenever winemakers feel that the wine is in need of some "European" character. Thanks to its high affinity for combining aldehydes, Protan Pépin Oxilink is an ideal tool for aging wines in barrels or with micro-oxygenation.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 30 - 60 ppm 0.25-0.5 lbs per 1,000 gallons in whites or 200-400 ppm or 1.5-3 lbs/1,000 gallons in reds.

Available: 500 gram packs

TTB 27 CFR § 24.246



Protan Plus

Protan Plus is a combination of wood derived proanthocyanidins and yeast mannoproteins. It adds to the volume of red wines and supports color stabilization. It should be added during the second part of fermentation, or at the beginning of the aging process.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 200 - 400 ppm or 1.5 - 3 lbs/1,000 gallons

Available: 500 gram packs

TTB 27 CFR § 24.246



Protan Raisin

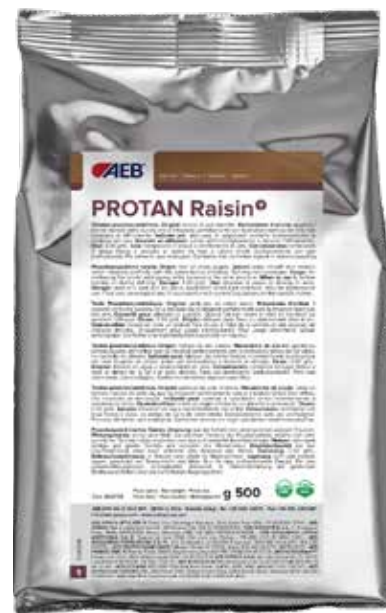
Adding Protan Raisin to a red wine is like adding extra days of maceration on the skins. It is a tannin extracted from grape peels, which brings the typical polymerized structure of the tannins naturally extracted from the skins. These contribute not only to the body, but also to the color stabilization and overall polyphenolic polymerization. Small additions to white and rosé wines help with the mid-palate as well as enhancing complexity

Usage: mix well into 10 parts of wine or must and add to the tank with a venturi system.

Dosage: 30 - 60 ppm 0.25-0.5 lbs per 1,000 gallons in whites 200 - 400 ppm or 1.5-3 lbs/1,000 gallons in reds.

Available: 500 gram packs

TTB 27 CFR § 24.246



Tanethyl

Tanethyl is a seed derived proanthocyanidin with an aldehydic bridge integrated in the structure, which guarantees high reactivity for polymerization with anthocyanins and other polyphenols. This characteristic makes it immediately available for the color to be locked and stabilized against the effects of sulfur, pH changes, oxygen and aging in general. Tanethyl is also recommended for wines in need of structure to polymerize, as it can start the process without the oxygenation needed to form aldehydic bridges.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 200-400 ppm or 1.5-3 lbs/1,000 gallons

Available: 500 gram packs

TTB 27 CFR § 24.246



Taniblanca Fresh

Taniblanca Fresh is a blend of proanthocyanidin and gallic tannins to bring a refreshing edge to white wines. Taniblanca Fresh, allows maintaining the aromas fresh, reminiscent of eucalyptol, balsamic and spicy notes. Used during fermentation, it protects the citrus aromatic notes.

Usage: mix well into 10 parts of wine or must and add to the tank with a venturi system.

Dosage: 60 - 200 ppm 0.5 lb-1.5 lbs per 1,000 gallons.

Available: 1 Kg bags

TTB 27 CFR § 24.246



Taniquerc

Taniquerc is an ellagic tannin, that brings nuances of toasted oak to help with aging, by providing a substrate for the oxygen to interact with the wine and form ethanal bridges. Ethanal bridges are the link in the polymerization of phenolics, including tannin with tannin and color with tannin.

Usage: mix well into 10 parts of wine or must and add to the tank during a pump-over.

Dosage: 200-400 ppm or 1.5-3 lbs/1,000 gallons

Available: 1 Kg bags

TTB 27 CFR § 24.246





Ellagitan Barrique Liquid

Ellagitan Barrique Liquid is the most “French” of the Ellagitan line, with the most vanilla notes. It opens the fruit of the wine, enhancing red and black fruit. Ellagitan Barrique Liquid, also brings a peppercorn note to the spices in the bouquet.

Usage: 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).

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

Available: 1 Kg bottles, 10 Kg containers

TTB 27 CFR § 24.246



A sediment will accumulate in the bottle.

This is normal, and it could be partially dissolved in wine or hot water.

EB Berry Mix

EB Berry Mix helps to stabilize color, but also introduces a soft note that brings structure and smoothness. On the nose it enhances the sweet notes of the fruit, and brings along a pleasant bouquet of spices and toasted oak.

Usage: 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).

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

Available: 1 Kg bottles, 10 Kg containers

TTB 27 CFR § 24.246



A sediment will accumulate in the bottle.

This is normal, and it could be partially dissolved in wine or hot water.

$\mu\text{g/g}$	EB Liquid	EB XO	EB Fruit Reserve	EB Berry Mix	EB Goud-Ron	
Furfural	+++	-	+++	++	++++	Caramel
5-Methyl furfural	++	++++	+++	-	++	
2(5H)-furanon	+	++	++	+++	+	
5-Hydroxy methyl furfural	+++	++++	++++	++	+++	
Coniferaldehyde	-	++++	++	-	-	Syrup
Guaiacol	+++	+	+	++	++++	Toasted
Syringaldehyde	+++	++++	++	++	++++	
Phenol	++	+	+	+++	++	Spices Cloves
Eugenol	+	+	+	+	+	
Isoeugenol	+	+	+	-	-	
4-Vinyl guaiacol	+	++	++	-	-	
cis-Wisky lacton	+	-	-	++	+++	Coconut
trans-Wisky lacton	++	+	+	+++	++++	
Vanilin	+++	++	+	+++	++++	Vanilla
Vanillic Acid	++++	++	+	-	-	
Acetovanillone	++++	+++	+++	-	-	
Homovanillic Acid	+++	+++	+++	++	++	
2,Phenil-ethanol	-	-	+	+++	++++	Fruity
Ethyl-succinate	-	+	++	++++	++	

Chart: Liquid tannins characteristics

Ellagitan Fruit Reserve

Ellagitan Fruit Reserve has the least impact on the aromatics of the wine among the liquid Ellagitan Barrique products. It is more subtle and should not be used to cover defects. It helps the wine to enhance what it already has, enhancing the fruit and opening the bouquet. Ellagitan Fruit Reserve also brings notes of almonds and caramel.

Usage: 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).

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

Available: 1 Kg bottles, 10 Kg containers

TTB 27 CFR § 24.246

A sediment will accumulate in the bottle.

This is normal, and it could be partially dissolved in wine or hot water.



EB Goud-Ron

EB Goudon-Ron helps stabilizing the color, but also introduces a soft note that brings along structure and smoothness. In the nose, it shows notes of “goudron” (tar), a typical descriptor of old world wines, reminiscent of the ones found in the great reds from Rhône and Piedmont.

Usage: 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).

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

Available: 1 Kg bottles, 10 Kg containers

TTB 27 CFR § 24.246

A sediment will accumulate in the bottle.

This is normal, and it could be partially dissolved in wine or hot water.



EB XO

EB XO 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.

Usage: 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).

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

Available: 1 Kg bottles, 10 Kg containers

TTB 27 CFR § 24.246

A sediment will accumulate in the bottle.

This is normal, and it could be partially dissolved in wine or hot water.



Ellagitan Barrique Rouge

Ellagitan Barrique Rouge is a granulated tannin that 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 sulfur dioxide. Furthermore, there is no color or wine loss due to wood absorption.

Usage: rehydrate in warm water (35°C/95°F) or wine, for at least 0.5h 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: 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).

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

Available: 500 gram packs and 10 Kg bags

Contains product/s that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation (EU) 2021/2117.



Ellagitan Barrique Blanc

Ellagitan Barrique Blanc is a colorless version of the powdery oak tannin described above. Extracted from French oak staves, it will have minor effects on color. It 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, that preserve varietal aromas. It will also develop bouquet complexity by regulating redox potential during the fermentation and post-fermentation stages.

Ellagitan Barrique Blanc inhibits bacteria or mold contamination reducing the need for sulfur dioxide. It is recommended for those wines that have had a prolonged cold skin-contact maceration, are often rich in polyphenols, and tend to brown. Treated wines with Ellagitan Barrique Blanc are intense and complex on the nose due to the synergy of the tannin with primary fermentation aromas. Wines will be fresh and lively on the palate, free of unpleasant bitterness, and rich in body, as with post oak barrel aging.

Usage: 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.

Available: 500 gram packs

Contains product/s that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation (EU) 2021/2117.



One of the critical stages in juice and wine production is the dual process of clarification and stabilization, which is essential for enhancing the sensory appeal and longevity of the wine. At its heart, clarification is the art of separation, a dance of precision where winemakers remove solid impurities from the liquid treasure. Beyond the visual clarity, wines must also stand the test of time and conditions, arriving at physical stability. This stability ensures that the wine maintains its clarity and does not develop an unsightly haze after bottling. At the winemakers disposal is an arsenal of techniques to remove unstable proteins and other macromolecules that could compromise wine integrity.

A detailed illustration of a winemaker in a white shirt and dark apron, focused on pouring a thick, golden liquid from a large sack into a large wooden vat. The vat is filled with a deep red liquid, likely wine. The background shows a rustic cellar with wooden barrels and shelves. The overall style is a detailed, textured illustration with a warm, earthy color palette.

CHAPTER 7

Finally, we will examine the crucial objective of stabilization. Like setting the final piece of a puzzle, stabilization ensures that the wine's crystalline appearance remains unaltered through the trials of aging, storage, and varying environmental factors such as temperature fluctuations, oxidation, exposure to light, and potential microbial threats.

STABILIZERS AND FINING AGENTS

Must protection

Aromax B4

Aromax B4 is ascorbic acid and potassium metabisulfite immobilized on an inert substrate for easy dispersion on grapes and juice to protect the fruit during machine harvesting or grapes transportation. It optimizes antioxidation and antiseptic protection. The perlite used to immobilize the ascorbic acid and the potassium metabisulfite, floats, only releasing the components when in contact with the juice. In this way, it forms a protective layer on the surface of broken berries, juice in the gondolas, or in holding tanks.

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

Dosage: 0.5-1 kg/Ton. (1 Kg/Ton will release 54 ppm of sulfur dioxide and 60-70 ppm ascorbic).

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

Available: 5 Kg bags
TTB 27 CFR § 24.246



Protect-F

Protect-F is high grade fumaric acid based product with added antioxidant tannins (gallic and proanthocyanidinic). It's used in red and white wines to prevent spontaneous ML or the implantation of lactic acid bacteria. If added early during the fermentation it will be consumed by the yeast and will not block the inoculum of Malolact. Fumaric acid has also an effect on TA and pH similar to the one of Tartaric Acid. The high quality of this acid makes it particularly pleasant and adds freshness to the wines. The portion of antioxidant tannins will not have much effect on flavor but it will prevent oxidation and precipitate with protein

Usage: dissolve the 1:10 dose, adding it to the mass to be pumped over.

Dosage: 40-120 g/Hl or 3-10 lbs/1,000 gallons.

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

Available: 1 Kg and 5 Kg bags
TTB 27 CFR § 24.246



This is normal, and it could be partially dissolved in wine or hot water.

Chitosan based products

Chitosan is a natural derivative of fungal origin, that is obtained starting from the partial deacetylation of chitin (a polysaccharide composed of N-acetyl-D glucosamine units) in an alkaline environment.

Objectives:

- To reduce heavy metal content, notably iron, lead, cadmium, copper.
- To prevent iron haze, copper haze.
- To reduce possible contaminants, especially ochratoxin A.
- To reduce undesirable micro-organisms, notably *Brettanomyces*.

Its particular charge structure makes chitosan functional to the disintegration of the membranes of bacteria and yeasts. In fact, one of the mechanisms by which chitosan acts, results from the fact that the outside of the cell wall for bacteria is negatively charged. Therefore, being positively charged, it acts by complementary charge. On the other hand, yeasts do not have an obvious negative charge, but it is thought that they incorporate chitosan into their own wall during growth. This leads to wall disintegration.

An alternative mechanism of action can be traced back to the binding of chitosan to microbial DNA, which would effectively block DNA transcription and replication.

Name	Composition	Application	Bacteria		Brett.	Yeast NS /molds	Activity delay	Extra	Sub SO ₂	Dose/hL
			G+	G-						
Chitocel	Chitosan, yeast hulls	beginning AF /end AF	++	++	+++	+++ NS	>8day	adsorbent	+	3-30g/hL
Chitocel Must	Chitosan, yeast hulls and autolysates, Gallic tannins and Acacia	beginning AF /FA	+	+	++	+NS +molds	>8day	Antiox	+++	15-40g/hL
Chitocel Red	Chitosan, yeast hulls and autolysates, Acacia and quebracho tannins	beginning AF /end AF	+	+	++	+NS +molds	>8day	Antiox	+++	15-60g/hL
Antibrett 2.0	Yeast hulls , chitosan, β- glucanase	beginning AF /end AF	++	++	++	++NS ++molds	>4-8day	β-glucanase	+	5-25g/hL
Chito-F	Chitosan, fumaric acid	end AF	+++	+	++	+NS	>2day	Antibacteric Acidifier	++	30-75g/hL

Chart: AEB Chitosan based products

Chitocel

Chitocel is based on Chitosan, a natural polysaccharide of fungal origin (derived from *Aspergillus niger*). It is biodegradable and non-allergenic. This 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 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 is 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 forming 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, and copper, thus preventing the ferric casse and the copper casse.

Usage: 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).

Available: 250 gram bags

TTB 27 CFR § 24.246



Chitocel Must

Chitocel Must is a preparation of chitosan, gallic and proanthocyanidin tannins, yeast hulls and autolysates with naturally occurring glutathione for white wine. Due to its antimicrobial action, it is an excellent alternative to sulfur, while the glutathione assists in antioxidant protection. It is very useful at the early stages of fermentation, however, thanks to the antioxidant components, it is a safe adjunct also at the end.

Usage: dissolve the dose in the must and add it to the mass.

Dosage: in musts, mainly in maceration. 1-3lbs/1,000 gallons as appropriate.

Storage: store in a cool, dry place away from direct light and heat.

Available: 1 Kg packs

TTB 27 CFR § 24.246



Chitocel Red

Chitocel Red is a product based on chitosan, proanthocyanidin tannins and yeast hulls. It helps to reduce the content of heavy metals such as iron and copper, and additionally reduces potential contaminants such as ochratoxin due to its synergy with yeast hulls and tannins. During the early stages of fermentation, it helps to stabilize the color, protects from oxidation and controls spoilage microorganisms. It also creates a shield against bacteria or other contamination. At the end of the fermentation process it will protect the wine while aging.

Chitosan is a valuable support to facilitate the racking and clarification of musts. It also has an important antiseptic action by inhibiting microbiological activity making it an excellent alternative to sulfur dioxide. Chitocel Red promotes clarification and inhibits unwanted fermentations, prevents the development of acetic bacteria, or malolactic fermentation, where unwanted. One of the mechanisms is related to the fact that the outside of the cell wall for bacteria is negatively charged, and therefore acts, being positively charged, by charge complementarity. An alternative mechanism of action is due to the binding of chitosan with microbial DNA, which would effectively block its transcription and replication, clearly inhibiting the growth of microorganisms in this medium.

Usage: dissolve the dose in the must and add it to the mass during pump-over.

Dosage: in musts, mainly in maceration. 1-5 lbs/1,000 gallons as appropriate.

Storage: store in a cool, dry place away from direct light and heat.

Available: 1 Kg packs

TTB 27 CFR § 24.246



Tartaric stability and de-acidification

Crystalflash

Crystalflash is 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 (around freezing temperature). The instantaneous formation of a very thick cloud of rising micro-crystals, facilitates 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. It also shortens the cold holding time in a tank to a very short period, usually between 3-5 days.

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

Storage: 4 Years stored at room temperature in a non-humid environment.

Composition: ingredient percentage and purpose:

- Potassium Bicarbonate 40%, which helps to disperse the product, and crystalize tartrates thereby helping precipitation.
- Cream of tartar 30%, helps with nucleation.
- Bentonite 15%, helps with settling.
- Potassium tartrate (tartaric Acid) 10%, works in synergy with cream of tartar to speed up nucleation and balance acidity.
- Cellulose 5%, to help with dispersion.

Available: 1 kg packets

TTB 27 CFR § 24.246



Deacid

Deacid is a formulation of highly soluble potassium bicarbonate and neutral potassium tartrate salts. It is able to induce a decrease in the total acidity with neutralization reactions and a subsequent complete and quick precipitation of 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.

Usage: add directly to the must or wine, little by little, by pumping over in order to avoid a 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 carbon dioxide 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). For higher additions, we recommend a preliminary laboratory trial.

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

Available: 5 Kg and 25 Kg bags

TTB 27 CFR § 24.246



New-Cel and New-Cel +17 (concentrated version)

New-Cel and New-Cel +17 are sodium carboxymethyl cellulose used to stabilize wine by preventing tartrate precipitation. New-Cel is a colloidal protector that wraps the tartrates crystal structure with a protective film and deforms them making their growth impossible.

Studies have demonstrated the savings when using this technology instead of the traditional cold stabilization. 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 issue, but if it is marginal, CMC will cause a haze that will need to be filtered. We therefore recommend checking protein stability after CMC addition, on a sample and make sure protein haze does not 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.

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

Dosage: 100-150g/hL or 8/12 lbs/1,000 gallons for New-Cel, 12-60 g/hL or 1-5 lbs/1,000 gallons for New-Cel +17.

Storage: 1 year at room temperature in a non-humid environment.

Available: 1 Kg bottles and 25 Kg containers

TTB 27 CFR § 24.246



Redox Adjustment

Desulfur

Desulfur is a stabilized liquid copper sulfate used to remove hydrogen sulfide and reductive odors in general. If wines show a bouquet that seems to be too “closed” or affected by reductive odors, try adding a drop of Desulfur in the glass. If the wine changes positively, the wine is most likely reduced by hydrogen sulfide or mercaptans, and can be treated with an adequate addition of Desulfur. If the problem is mercaptans, do not aerate. Mercaptans can be removed to some extent with appropriate Desulfur additions (about twice the amount needed for hydrogen sulfide 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 approximately 500 ppm of ascorbic acid. This can take up to 60 days. After that we can use Desulfur.

Usage: preliminary hydrogen sulfide tests should be conducted.

Add Desulfur 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). The addition of 10 ml/hL of Desulfur provides 0.25 mg/l of copper therefore the max addition rate of Desulfur is 40 ml/hL (assuming that there is no copper in the wine already).

Bench trial: adding an average drop size (0.05 ml) into 1 liter equals to a Desulfur addition of 50 ppm. Average dosage is 100 ppm.

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.

Available: 1 Kg bottles

TTB 27 CFR § 24.246



Microbiological stabilization

Antibrett 2.0

Antibrett 2.0 is an innovative product based on yeast hulls, β -glucanase enzyme and fungal Chitosan. Its components are particularly active in inhibiting the action against *Brettanomyces* yeasts. They also have high adsorbing properties against 4-ethylphenol and 4-ethylguaiacol, compounds which can give wines unpleasant smells of horse sweat and medicine.

The production system used to obtain these hulls is aimed at degrading only the yeast cell walls, chitin in particular, by safeguarding the structure of the cytoplasmic membrane, which has a high specific adsorbing capacity. Thanks to the antimicrobial action obtained from the synergy of Chitosan and β glucanase enzyme, it inhibits the production of vinyl reductase. These participate in the transformation of the cinnamic acids naturally present in wines, in the corresponding ethyl derivatives, responsible for smells attributable to *Brettanomyces*.

Usage: treat the mass taking care to homogenize the product. Leave in contact for 8-10 days, then decant. A free sulfur dioxide content of not less than 15 mg/L is recommended. Check protein stability after the addition of Antibrett 2.0

Dosage: 5-25 g/hL depending on the kind of pollution.

Storage: store in a cool, dry place away from direct light and heat.

Available: 500 gram cans and 4 Kg containers



Lysocid W

Lysocid W is a 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.

Usage: dissolve Lysocid W in a, 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:

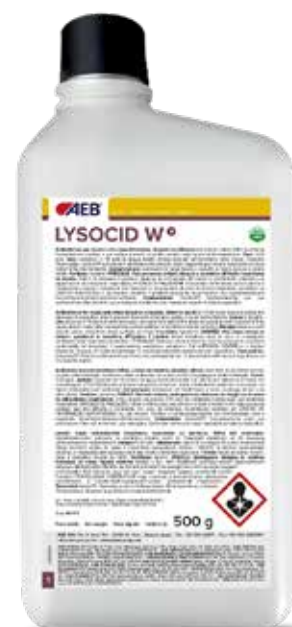
25-40 g/hL (2-3 lbs./1000 gal).

Storage: 2 years stored in cold temperature in a non-humid environment.

Available: 500 gram bottles

TTB 27 CFR § 24.246

Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulations.



Microcid-F

Microcid-F due to its potassium sorbate content, helps preventing re-fermentation of wines containing residual sugars. Thanks to the presence of fumaric acid, Microcid-F helps control the lactic acid bacteria species that convert sorbic acid into 2-ethoxyhexa-3,5- diene, a molecule that can be traced back to the geranium aroma.

Usage: dissolve in about 10 parts of warm water and add uniformly to the clarified and filtered mass.

Dosage: 25-60 g/hL (2-5 lbs/1000 gal).

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

Available: 1 Kg bags

TTB 27 CFR § 24.246



Product that will need to be listed on the QR code of the wines sold in the EU in accordance with regulation (EU) 2021/2117 (Potassium sorbate, Fumaric acid, Potassium Metabisulphate, Ascorbic Acid).

Proteins and phenolics stabilization

Bentogran

Bentogran is a pharmaceutical grade sodium bentonite for protein removal with low impact on the wine aromatics. The active surface of Bentogran will be 3-4 times larger if compared to a regular bentonite. This characteristic will yield larger size flocules 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 does not 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.

Usage: 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 unless you don't want to use too much water (warm being more effective and faster than cold) before usage. In any case try to use water/wine for 20 times the volume of Bentogran to maximize the swelling.

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

Storage: 4 years stored at room temperature in a non-humid environment.

Available: 1 Kg packs and 25 Kg bags





Carbosil

Carbosil is a liquid clarifier based on silica and decolorizing carbon. It allows a quick and efficient color removal in both musts and wines. The 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. Carbosil will yield a clear must/wine, with no trace of carbon and with a compact sediment.

Usage: 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 0.5 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 5-10 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.

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

Available: 25 Kg containers

TTB 27 CFR § 24.246



Catalasi

Catalasi is a blend of products used to cure oxidized wines or to add “freshness” to fermenting musts. In fermentation it also helps prevent “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 sulfur dioxide important to neutralize eventual peroxides produced by the oxidation of vitamin C.

Usage: 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 sulfur dioxide.

Storage: 2 years stored at room temperature in a non humid environment.

Available: 1 Kg packs and 20 Kg bags

TTB 27 CFR § 24.246

Contains Potassium Metabisulphite and Ascorbic acid, if used for fining before bottling this is a product that will need to be listed on the QR code of the wines sold in the EU in accordance with Regulation (EU) 2021/2117.



Catalasi AF Plus

Catalasi AF Plus is a mix of clarifiers bentonite, is in glass, pork/fish gelatin, 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. It is ideal also to ferment on for Pinot Grigio or in general, for white and rosé wines with high phenolics.

Usage: dissolve 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). 100 ppm.

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

Available: 1 Kg packs and 20 Kg bags

TTB 27 CFR § 24.246



Catalasi Vega

Catalasi Vega is a vegan complex 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. It 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 more fresh, 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).

Usage: 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. 8-12 lb/1,000 gallons or 100-150 g/hL to reduce strong oxidative conditions and to prevent pinking.

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

Available: 10 Kg bags

TTB 27 CFR § 24.246



Gelsol

Gel sol is a liquid pork 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.

It has little affinity with anthocyanins, and therefore, it is ideal for red wines because it does not cause any loss of color intensity. Gelsol is a liquid gelatin, prepared enzymatically, without the use of heat. The difference makes it more active if compared with dry products, where the use of high temperatures partially 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.

Usage: 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 one 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 recommended. Consider a specific weight of 1.2. For must clarification in combination with Spindasol, do trials starting from 60 ppm or 6 g/hL (1/2 pound/1,000 Gal) of Gelsol and compact with 5 to 10 parts of Spindasol or Carbosil (specific weight of 1.15). For both rosé, 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 in these cases 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.

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

Available: 25 Kg containers, 250 Kg drums, and 1,200 Kg totes
TTB 27 CFR § 24.246



Microcel

Microcel is a complex clarifier to be added to white musts when they start fermenting 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.

Winemakers use Microcel to ferment white and rosé wines to stop phenolic oxidation at its onset. Also, a significant amount of proteins is taken out early, 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. Potassium caseinate also fines for copper and iron (up to 50% of the initial content).

Usage: 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).

Storage: 3 years stored at room temperature in a non-humid environment.

Available: 10 Kg and 25 Kg bags

TTB 27 CFR § 24.246



Microcel AF

Microcel AF is the allergenic free version of the Microcel described above. The potassium caseinate 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.

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

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

Storage: 3 years stored at room temperature in a non-humid environment.

Available: 25 Kg bags

TTB 27 CFR § 24.246



Quickgel AF

Quickgel AF is an allergenic free clarifier for red musts and wines based on pork gelatin and activated bentonite, with no significant impact on color. Extremely effective and quick, it is the best choice when winemakers need to clarify cloudy juices or wines in a very short time. It enables to obtain brighter 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. It 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.

Usage: dissolve in about 10 parts of cold water, and let it rehydrate for 20-30 minutes. Add the slurry to the tank 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.

Available: 500 gram packs and 10 Kg bags

TTB 27 CFR § 24.246



Spindasol W

Spindasol W is liquid Silica for extra compaction of settling agents or carbon fining. When used in must, lees are heavier than when using just bentonite, settling is much faster and compact. It also does not adsorb aromatic molecules or 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, thereby minimizing the lees. Using Spindasol to help settle the fining agents always improves yield and reduces work.

Usage: mix Spindasol W 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 W 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 0.5 hour after the protein 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)

Storage: sealed containers will last for 2 years stored at room temperature in a nonhumid environment. Do not store below 5 degrees Celsius.

Available: 25 Kg bags

TTB 27 CFR § 24.246



Ve-Gel

Ve-gel is a clarification product based on vegetable proteins. Its high reactivity towards bentonite and silica helps to obtain a quick clarification with compact deposits. In must cold settling, Ve-gel not only achieves a better technological result, but also more favorable parameters. The clarification obtained has lower NTU's than the ones 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 used during flotation, alone or in association with bentonite. Ve-Gel has a low reactivity towards the coloring matter and can also 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).

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

Available: 1 Kg packs and 20 Kg bags

TTB 27 CFR § 24.246



The background of the page features three vertical, perforated metal tubes and one horizontal, perforated metal tube lying in front of them. The tubes are made of a dark, possibly stainless steel, material with a series of horizontal slits or perforations. They are set against a solid blue background. The tubes are arranged in a way that they appear to be part of a larger assembly or are individual components.

CHAPTER 8

FILTRATION

Filtration is a crucial step in winemaking, one that protects the wine from spoilage, but if overdone, it can diminish wine quality. It is important to size well the flow allowed through each cartridge, and to pick the right material and porosity for each step.

Preparing the wine for final filtration

M3 High Performance

The M3 High Performance high-capacity cartridge is an alternative to cross-flow, distinguished by its radial pleating and high filter surface area.

Its special features ensure numerous advantages:

- Depth filtration with high filtering surface area
- High retention capacity of suspended solids, ensuring high performance, durability and lower costs
- Faster replacement of filter elements
- Fewer o-rings and reduced risk of by-pass
- Significantly lower disposal costs compared to cartridges considering the same filter surface area
- Broad chemical compatibility for filter element regeneration
- FDA-compliant polypropylene construction
- High retention efficiency for quality filtration
- Choice of different micrometers

Each cartridge can guarantee a prefiltration with a flow of 45 hL or 1,200 gallons/hr, normally with three steps 5-2-1 Micron.

The flow can be accelerated by using multiple housings per step.

Regeneration and sanitation:

M3 High Performance filter elements can be repeatedly regenerated also in backflush, with hot water (max 80°C- 176°F), sterilized with steam up to 121°C- 250°F.

They can also be used in hot caustic cycle, even with peroxide.



Prefiltration with PP Cartridges

In order to protect the final PES membrane is very important to use a less sophisticated cartridge made of polypropylene, which will retain most of the colloids and particles, thereby keeping those from plugging the more expensive final membranes. It is important not to go too fast on the flow in order not to push colloids through these pre-filters. Ideal flow through each 30 inches cartridge is about 1,000 liters - 265 gallons/hr. Keeping the flow at this rate will guarantee a life of 150,000 liters or 40,000 gallons of wine filtered through each final membrane.

Absolute PP Membran Protect

When filtering wines through a 0.45-micron final membrane it could be a good idea to put an even tighter prefilter before. This way we are sure that most particles will not get to the final membrane. Installing a pre filter as tight as an AEB Absolute PP Membrane Protect is recommended especially in a particular circumstance. When measuring NTUs before and after the prefilter normally used, we do not see any changes in turbidity. This is a simple test that would prove that the prefilter is not performing and we should install a tighter one.

An absolute prefilter composed of six layers made in polypropylene and with a porosity equal to 0.4 micron. Its configuration is suitable for frequent chemical regenerations.

Absolute PP

AEB recommends using 0.4-micron prefilters especially when coming out of a crossflow, when NTU's should be as low as 0.2 and going into a 0.45 membrane. For all the other situations, AEB-DANMIL also produces a wide range of prefilters in polypropylene consisting of 4 layers and with different porosities.

- **ABSOLUTE PP MEMBRAN PROTECT 0.40um**
- **ABSOLUTE PP 0.6um**
- **ABSOLUTE PP 1um**
- **ABSOLUTE PP 3.0um**
- **ABSOLUTE PP 5.0um**
- **ABSOLUTE PP 10um**

Different porosities for DANMIL pre-filters.



Absolute PES Final Membrane

PES (Polyethersulfone) membranes are a type of filtration membrane commonly used in various industries, including bio-pharmaceuticals, food and beverage, water treatment, and more. PES membranes feature some key characteristics:

- **Chemical Resistance:** PES membranes are resistant to a wide range of chemicals, including acids, bases, and organic solvents. This property makes them suitable for regeneration even with alkaline detergents. Can be stored with 0.2% peracetic acid.
- **Thermal Stability:** PES membranes can withstand relatively high temperatures compared to other membrane materials. DANMIL Absolute PES membranes can be repeatedly regenerated with hot water at 80°C-176 °F, sterilized with steam up to 121°C - 250°F. They can also be used in hot caustic cycle, even with peroxide.
- **Hydrophilicity:** DANMIL Absolute PES membranes exhibit hydrophilic properties.

Overall, AEB DANMIL PES membranes offer a versatile and reliable solution for a wide range of filtration applications, particularly those requiring chemical resistance, thermal stability, and precise particle or solute separation. If well protected with the adequate pre-filter, AEB final PES membranes can live through 150,000 liters or 40,000 gallons of wine filtered.

- **ABSOLUTE PES 0.2um**
- **ABSOLUTE PES 0.45um**
- **ABSOLUTE PES 0.65um**
- **ABSOLUTE PES 1.2um**

Different porosities for DANMIL final membranes.



Filtering Pads

DANMIL filtering pads and modules are designed for the filtration of liquids such as wine, oil, beer and juices.

DANMIL depth filter sheets are made of natural, first choice and particularly pure materials, carrying a cationic charge.

They are made of cellulose finely shined broadleaf and conifer fibers, kieselguhr and perlite at different concentrations.



DANMIL 110/130 Sterilizing filtration with reduction of microorganism	
CHARACTERISTICS	APPLICATIONS
Narrow-pored structure of the filter media, combined with an electrokinetic potential with adsorption action (charged) to yield a high rate of microbiological retention.	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 50/70 Filtration with reduction of microorganism and microfiltration	
CHARACTERISTICS	APPLICATIONS
They allow to reach high levels of clarification for their effective retention capacity of the finest particles and microorganism.	Storage and bottling of microbiologically stable wines.
DANMIL 30 Rough, polishing filtration	
CHARACTERISTICS	APPLICATIONS
They have a high volume hollow structure and high turbidity absorption capacity.	Polishing of the product, be it wine, beer, oil or juices.

Chart: Applications for different DANMIL pads

Sheet	Porosity	Thickness (mm)	Tear resistance in wet state (psi)	Water flow rate delta P at 14.5 psi (l/m ² /min)
DA30 (matches Steril 300 XL)	5 - 12 micron	3.8	> 7.2	350 - 400
DA50 (matches Steril 500 L)	3 - 6 micron	3.8	> 7.2	200 - 240
DA70 (matches Steril 700 L)	1.5 - 3 micron	3.8	> 7.2	160 - 200
DA110 (matches Steril 1100)	0.5 - 0.8 micron	3.8	> 11.6	68 - 80
DA130 (matches Steril 1400)	0.4 - 0.6 micron	3.9	> 7.2	42

Chart: Applications for different DANMIL pads

Pads sterilization (optional)

DANMIL pads can be sterilized with hot water or saturated steam at a maximum temperature of 134°C/273°F. During this phase it is necessary to loosen the compressed filter pack slightly and make sure that the complete sterilization of the entire filter system is carried out. Final compression should only be performed after the cooling of the filter pack.

Pads sterilization with hot water	
Flow rate must be similar to the one used in operations	
The water must be demineralized and free from impurities	
Temperature	80°C / 176°F
Duration	Half hour after temperature has been reached
Pressure	At least 0.5 bar or 7.2 psi at the outlet
Steam sterilization of pads	
The steam must be free from impurities	
Temperature	134°C / 273°F
Duration	20 minutes starting from when all the valves are streaming
Pressure	50 liters/m ² at 1.5 x the filtration flow rate

Chart: applications for different DANMIL pads

Direction of use: each DANMIL sheet consists of: A rough side, representing the entrance of the filtered product. A smooth side, representing the exit of the filtered product.

Pressure difference: according to the standard operating mode, filtration must be halted when the maximum permissible pressure difference of 300 kPa (3 bar) is reached. To work under maximum safety conditions, a pressure difference of 150 kPa (1.5 bar) must not be exceeded during filtration for retention of microorganisms.

Disposal, handling and storage: thanks to their composition, DANMIL depth filter sheets are biodegradable. However, the requirements of the local authority must be observed depending on the filtered product.

Carbon Pads

Powdered activated carbon is widely used in the food and beverage industry for absorption applications, but it has significant drawbacks relating to the handling of bulk carbon powder, cleaning of the process equipment, as well as time and costs associated with carbon removal from the process.



DANMIL Carbon pads alleviates these concerns by incorporating activated carbon within a matrix of cellulosic fibers. DANMIL Carbon pads are available in the format of 400 mm x 400 mm and they are made of cellulose, powdered activated carbon and diatomaceous earth (DE, Kieselguhr).

Applications:

- De-chlorination of water
- Correction of color, flavor and odors in distilled spirits
- Decolorization of sweetener and sugar syrups
- Color correction in juice and beer applications
- Gelatin decolorization and deodorization

Advantages:

- Adsorption efficiency is greater than an equivalent amount of bulk powdered activated carbon
- Reduction of the overall process time and increase of product yield
- Better color removal, an internal comparative study using the same carbon grade showed up to 150% better color removal efficiency when compared to bulk PAC (Powdered Activated Carbon)
- Absence of carbon dust and ease of use thanks to the Carbon-impregnated media
- Good permeability with excellent filtrate quality
- High economic efficiency due to a long service life

Perlite filtration earths, pre-coat and body feed

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 gross filtration.

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

Should be used in a variable dose between 0.8 and 1 kg (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.

Fibroxccl VAC

Vacuum filters tend to have an extremely compact layer of earths that eventually breaks or plugs, Fibroxccl VAC mixed at 10% with the DE used for the filtration guarantees a smooth cut of the top layer, 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 Fibroxccl 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. Fibroxccl VAC can also be used in conjunction with the body feed in pressure filters for particularly hazy musts and concentrates.

Silite Mini Speed

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

Perlite with 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.

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: 0.6-0.18.

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

Appendix 1

Low to No Alcohol Wines:

AEB does not make specific tools to obtain low or zero alcohol wines through separation, but wines that have gone through that process sustain some serious stress, losing their balance in favor of very a sharp edge. Also, there is a significant loss of aromatics. In both situations AEB technologies can assist the winemaker.

- Starting from fermentation it is important to maximize aromas expression and AEB carries a whole line of nutrients geared to enhance certain profiles, basically to provide the food that yeast needs to convert amino acids in esters and thiols. We recommend the Fermoplus Tropical for whites, the Fermoplus Red Berry for reds and the Fermoplus Rosé for pinks.
- Yeast choice is also important as some strains are better emphasizing certain standard aromatics. Fermol Arôme Plus and Fermol Red Fruit are what we recommend, for whites the first and for reds and rosé the latter.
- In Fermentation, some volume adjustment can be boosted to counterbalance the sharpness due to the absence of the volume and sweetness normally brought by alcohol. Yeast derivatives rich in polysaccharides like from the Bâtonnage line can provide a mellow component to become perfectly integrated because of its yeast origin.
- Finishing with a mannoprotein like Super-Mann or a soft gum like Arabinol Dolce or Arabinol Super Rouge brings sweetness without instability and far fewer calories than sugar.
- A tannin like Protan LXP extends the lingering of the finish in whites and rosé.
- Ellagitan Barrique Liquid can bring structure and an oak component to non alcoholic reds with certain ambitions.



Appendix 2

Wine in a can

Wine in a can is part of the range of products packaged by companies aiming to cater to the tastes and needs of the new generation of Millennials and Zoomers, as well as the trends associated with young people in general.

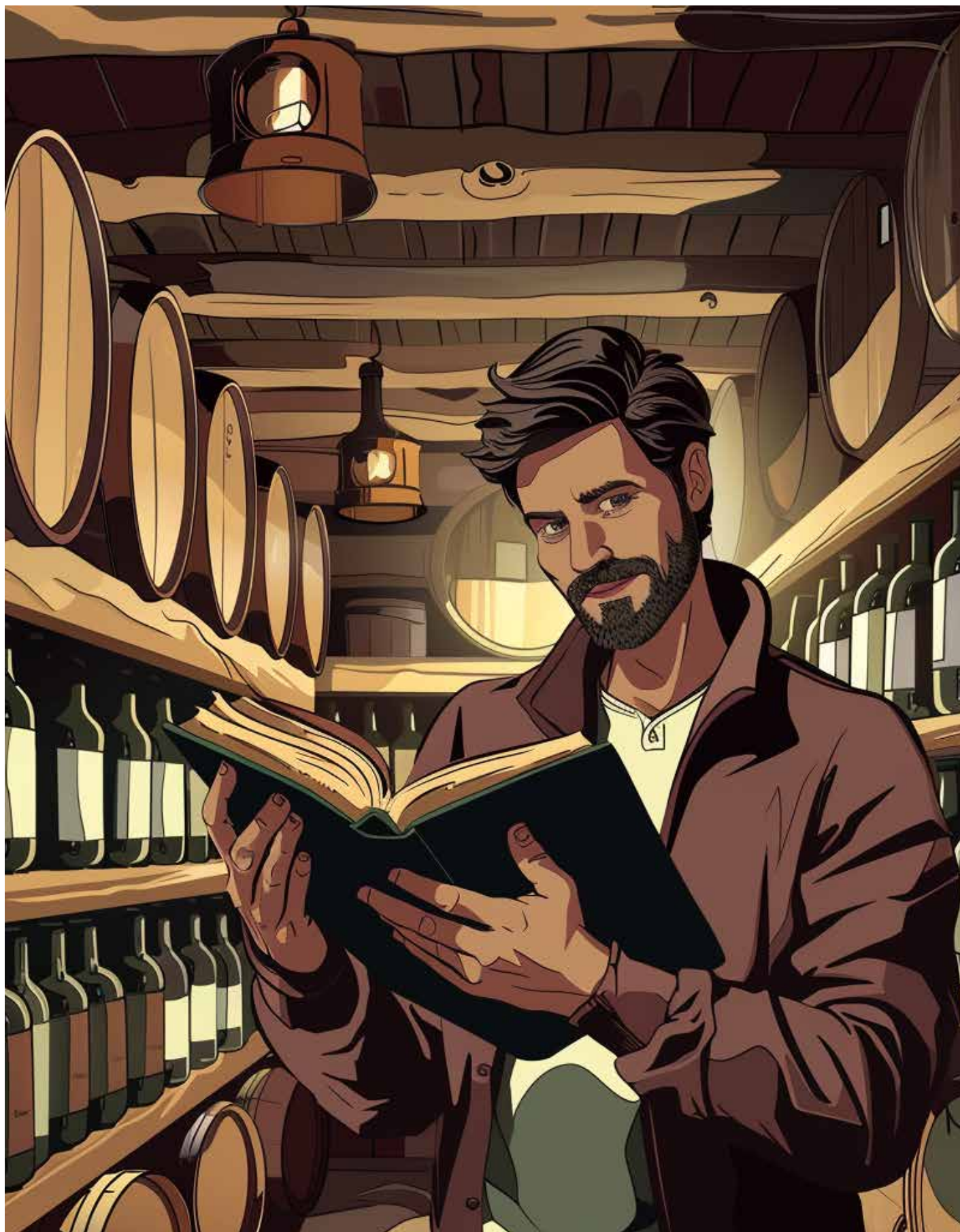
But what are the fundamental requirements for a successful product?

Technical Background:

The Container: Aluminum is a highly reactive material, but when it comes into contact with fluids, it forms a passive layer (Vargel 2004) that isolates it, making it inert and suitable as a material for containers. Despite this passive layer, aluminum corrodes in an acidic environment, which is why an extremely thin protective layer lines the can.

The Wine: The main issue with wine in a can is reduction. It poses a higher risk in this type of container compared to any other. Wine in contact with aluminum always carries risks of reduction (Mrak et al. 1937). However, combination of aluminum and the presence of sulfur dioxide exacerbates the problem further (Rankine 1983, Daiwa 2006, Trela et al. 2019) due to a redox reaction between aluminum and sulfur dioxide in an acidic environment. Sulfur dioxide can reach the aluminum by passing through the protective liner, along with other volatile compounds that are consequently dissipated, resulting in aroma loss. The choice of the liner can make a difference, but there are other technologies that can help:

- Adding Arabinol Arome can contribute to protect the aromas.
- Keeping the pH higher helps to have less molecular sulfur dioxide spreading through the liner and containing the reaction that produces hydrogen sulfide.
- Additions of tannin from the Protan line (such as Protan Fresh) can help maintain the wine's freshness despite a higher pH.
- Alternatives to sulfur dioxide, such as those based on fumaric acid and specific tannins
- (Protect-F), can aid in preserving the product from both a microbiological and oxidative standpoint, while being cautious not to lower the pH too much.
- Copper additions can accelerate the reaction that corrodes the aluminum, increasing the formation of hydrogen sulfide. Alternatively, to preserve aromas in the wine, ellagic tannins from the Ellagitan line (such as Ellagitan Chêne) can be used.
- Wine in a can requires a targeted dosage of carbon dioxide, even for still products, to create a "puff" effect when the can is opened. Typically, regulation hovers around 1,800-2,000 ppm. AEB provides an equipment called AEB Isiox, with different technical features, both capable of managing oxygen and carbonation in the packaging process.



Appendix 3

The Law

Below is a list of the products contained in this catalog. The materials listed in this section are approved as being consistent with good commercial practice in the production, cellar treatment, or finishing of wine, and where applicable, in the treatment of juice, within the “Specific TTB limitation” of this section and subject to the certain conditions.

Note that, where water is added to facilitate the solution or dispersal of a material, the volume of water added, whether the material is used single or in combination with other water-based treating materials, may not total more than 1% of the volume of the treated wine or juice, or of both the wine and the juice, from which the wine is produced.

See chart on the next page

§ 24.246 Materials authorized for the treatment of wine and juice	
Materials and use	Specific TTB limitation (if applicable)
Acacia (Gum Arabic): to clarify and stabilize wine	The amount used must not exceed 16 pounds per 1000 gallons (1.9 g/L) of wine
Alumino-silicates (hydrated) e.g., Bentonite (Wyoming clay) and Kaolin: to clarify and stabilize wine or juice	None
Ascorbic acid <i>iso</i> -ascorbic acid (erythorbic acid): to prevent oxidation of color and flavor components of juice or wine	May be added to grapes, other fruit (including berries), and other primary wine making materials, or to the juice of such materials, or to the wine, within limitations which do not alter the class or type of the wine
Bakers yeast mannoprotein: to stabilize wine from the precipitation of potassium bitrate crystals	The amount used must not exceed 3.3 pounds per 1000 gallons (400 mg/L) of wine
Calcium carbonate (CaCO ₃) (with or without calcium salts of tartaric and malic acids):	Different limitations apply. Check with TTB
Casein, potassium salt of casein: to clarify wine	See 27 CFR 24.243
Chitosan from <i>Aspergillus niger</i> : to remove spoilage organisms such as <i>Brettanomyces</i> from wine	The amount used must not exceed 0.04 pounds per 1 gallon (500 g/100 L) of wine
Citric acid	Different limitations apply. Check with TTBB
Copper sulfate: to remove hydrogen sulphide and/or mercaptans from wine	The quantity of copper sulfate (calculated as copper) added to wine must not exceed 6 ppm (6 mg/L). The residual level of copper in the finished wine must not exceed 0.5 ppm (0.5 mg/L)
Enzymatic activity: various enzymes and uses, as shown in the following entries	The enzymes preparation used must be prepared from nontoxic and nonpathogenic microorganisms
Ammonium phosphate/diammonium phosphate (<i>mono</i> - and <i>di</i> basic)	The amount used must not exceed 8 pounds per 1000 gallons (0,96 g/L)
Thiamine hydrochloride	The amount used must not exceed 0.005 pounds per 1000 gallons (0.6 mg/L) of wine or juice
Yeast, autolyzed	None
Yeast, cell wall/membranes of autolyzed yeast	The amount used must not exceed 3 pounds per 1000 gallons (0.36 g/L) of wine or juice
Fumaric acid	
To correct natural acid deficiencies in grape wine	The fumaric acid content of the finished wine must not exceed 25 pounds per 1000 gallons (3 g/L). 27 CFR 24.182 and 24.192
To stabilize wine	The fumaric acid content of the finished wine must not exceed 25 pounds per 1000 gallons (3 g/L). 27 CFR 24.244
Gelatin (food grade): to clarify juice or wine	None
Isinglass: to clarify wine	None
Lactic acid: to correct natural acid deficiencies in grape wine	27 CFR 24.182 and 24.192
Malic acid: to correct natural acid deficiencies in juice or wine	27 CFR 24.182 and 24.192
Malolactic bacteria: to stabilize grape wine	Malolactic bacteria of the type <i>Leuconostoc oenos</i> (<i>Oenococcus oeni</i>) may be used in treating wine
Fining agent for grape wine	The amount used must not exceed 2 parts of milk products per 1000 parts (0,2 % V/V) of wine
To remove of flavors wine	The amount used must not exceed 10 parts of milk products per 1000 parts (1 % V/V) of wine

§ 24.246 Materials authorized for the treatment of wine and juice	
Materials and use	Specific TTB limitation (if applicable)
Nitrogen gas: to maintain pressure during wintering and boiling or canning of wine and to prevent oxidation of wine	None
Oxygen and compressed air: various uses in juice and wine	None
Polyvinylpolypyrrolidone (PVPP): to clarify and stabilize wine and to remove color from red wine or juice	The amount used to treat the wine, including the juice from which the wine was produced, must not exceed 60 pounds per 1000 gallons (7.19 g/L) and must be removed during filtration. PVPP may be used in continuous or batch process
Potassium bitartrate: to stabilize grape wine	The amount used must not exceed 35 pounds per 1000 gallons (4.19 g/L) of grape wine
Potassium carbonate and/or potassium bicarbonate: to reduce excess natural acidity in wine and in juice prior to or during fermentation	The natural or fixed acids must not be reduced below 0.668 ounces per gallon (5 g/L)
Potassium meta-bisulfite: to sterilize and preserve wine	The sulfur dioxide content of the finished wine must not exceed the limitations prescribed in 27 CFR 4.22
Silica gel (colloidal silicon dioxide): to clarify wine or juice	Use must not exceed the equivalent of 20 pounds colloidal silicon dioxide at a 30% concentration per 1000 gallons (2.4 g/L) of wine. Silicon dioxide must be completely removed by filtration

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