

WINEMAKING

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CONTENTS

CHAPTER 1	Yeast: Fermol, the Right Yeast to Create Quality Wine	9
CHAPTER 2	Yeast Nutrients	17
CHAPTER 3	ML Secondary Fermentation	23
CHAPTER 4	Enzymes for Winemaking	27
CHAPTER 5	Tannins	35
CHAPTER 6	Polysaccharides	45
CHAPTER 7	Stabilizers and Fining Agents	51
CHAPTER 8	Filtration	59
CHAPTER 9	Sparkling Wines	65
CHAPTER 10	Helpful Hints	73



ABOUT US

AEB Group is a leader in yeast, filtration, cleaning solutions, process equipment and biotechnology for the beer, wine, and food industries. Headquartered in Brescia, Italy, AEB has a global presence with ten production sites, 18 commercial subsidiaries, and 12 R&D facilities with quality control laboratories.

As an innovator we focus on solutions, develop new applications, and enhance our process technologies, to help and support our customers' creative endeavours.

Our products are developed to high quality, safety, and reliability standards.

AEB leverages its 60-years of deep technical and process know-how, along with a passion to do good, to drive sustainable innovations by designing solutions that inspire safe and unique beverage and food experiences.

BE CREATIVE. BE PASSIONATE. BE AEB.

aeb-group.com/us/shop



OUR VISION

WE ARE CONSTANTLY SEEKING THE BEST FOR OUR CLIENTS.

Knowledge, technology, collaboration, and innovation have always been at the root of our commitment. We are THE reference for anyone working in the world of oenology and the food industry. Thanks to our know-how, we can offer exclusive, tailored solutions to meet any requirement.

To rely on AEB is to choose a complete and personalized service. Thanks to our experience and in-depth Research and Development, we can provide you with a “360 degree” support.

Our offer is unique in its kind. It includes high quality products, innovative equipment and exclusive assistance and analysis.

We are dedicated to giving our best: communicating with our partners to constantly improve our products and create new ones to better meet the market needs.

Alongside our specialization in the field of oenology, we also aim to become the leading supplier in the beer, fruit juice and cider sector as well as in all other fields of the food industry.

People are at the heart of our commitment: customers, researchers and suppliers with whom we share close ties for a mutual long-lasting growth.

We are AEB!

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ORGANIC WINEMAKING

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

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



Scan to download the complete list of our certified products compatible for organic winemaking.



AEB Group's proposal for the production of organic wines has always been based on the development of the best solutions to obtain wines in line with market expectations, enhancing the value of grapes with the aim of reducing or eliminating the use of sulfur dioxide.

AEB is the best qualified partner for organic wine making with a 360° offer that supports you through the entire production process: BIO certified products, automatic filtration systems by Innotec, and specific equipment for stabilization and cleaning in the cellar are core aspects of our offer.

Among the certified products are:

Organic Yeast

- Levulia® line
- Alcomeno
- Torula
- Probios
- Primaflora® VR and Primaflora® VB, for red and white wines respectively.

Organic Nutrient

- Auxilia, a nutrient based on yeast cell walls

Fermentation & Finishing Tannins

- Protan Q Bio

Gum Arabic

- Arabinol® Bio D
- Arabinol® Bio L

All certifications and declarations regarding these products are readily available. For more information and to discover the complete line of BIO products please visit our website.

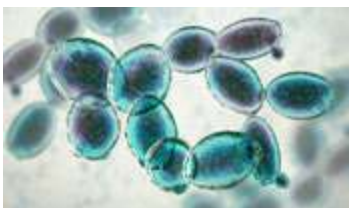
CHAPTER 1

YEAST:

FERMOL, THE RIGHT YEAST
TO CREATE QUALITY WINE

WHY WE USE DRY SELECTED YEAST

To set the process of fermentation into action, the sugar present inside the grapes needs to come into contact with millions of



viable yeast cells. Under the right conditions, these yeast cells native to the wine region have the ability to begin a spontaneous fermentation. The results of a native fermentation however, may not be desirable. These lead to anomalous odors, reductions, high volatile acidity, volatile phenols, oxidations, consumer health effects with biogenic amine production and stuck fermentations due to low natural yeast population at 1×10^3 to 1×10^5 cells per milliliter.

To correct and guide the fermentation in positive direction, we recommend AEB dry selected yeast at a dosage of 20 g/HL (200 ppm), which yields 2×10^6 per milliliter of active yeast cells. This will ensure a strong, secure fermentation with enough active yeast cells to out compete the native microorganisms with directed and desirable organoleptic characteristics in the wine.

YEAST FOR WHITE WINES

For added fermentation security, we recommend the AEB Reactivateur, a fully automated machine that guarantees a higher viability of the inoculum and immediate success to start the fermentation.

FERMOL AROME PLUS

Produces intensely aromatic wines, in which the varietal nuances of the cultivar harmoniously combine with the fermentative aromas produced by the yeast. Fermol Arôme Plus creates wines with elegant taste supported by good acidity. This strain is highly resistant to high alcohol content and sulphur dioxide, and is able to start fermentation at low temperatures (10-15 deg C).

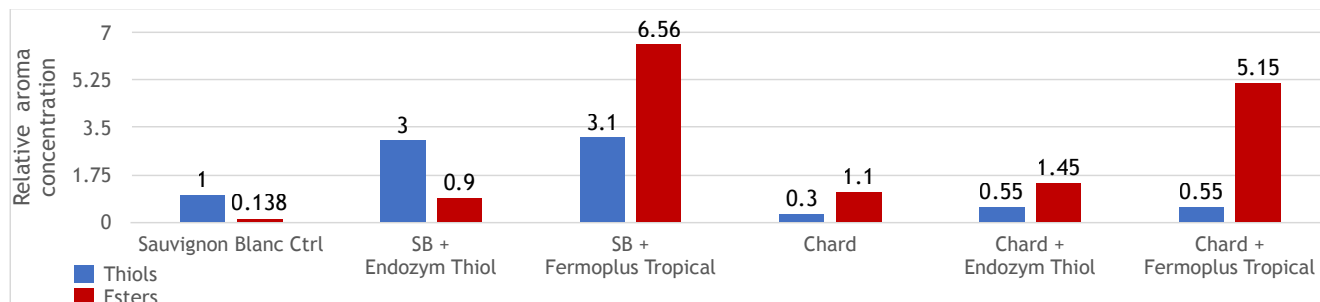


Winemaker's note: When using this strain, be aware of the high YAN demand.

Available in 10 kg bags and 500 gram packs.

FERMOL SAUVIGNON

S. Bayanus strain of yeast that consistently dominates and finishes fermentations. Releases bound sulfur compounds present in Sauvignon Blanc grapes and similar aromatic white varieties, increasing levels of perceived thiols in finished wine.



Aroma enhancement of Fermol Sauvignon in Sauvignon Blanc and Chardonnay grapes. Histogram compares primary aromas (thiols) and secondary aromas (esters) after the addition at the beginning of fermentation of 300 ppm of Fermoplus Tropical or 5 ml/hL of Endozym thiol. The use of Endozym thiols results in an expression

of the varietal compounds, while the Fermoplus Tropical results in an increased complexity, with primary and secondary aroma enhanced. Tondini et al. (2019). The Effects of Pre-fermentative Additions on Yeast Volatile Aromas and Thiols in Sauvignon Blanc and Chardonnay. Poster presentation ASEV/AWITC 2019.

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

Available in 10 kg bags and 500 gram packs.

FERMOL CHARDONNAY

highlights the nuances of ripe and exotic fruit and, thanks to its high production of mannoproteins, produces wines with a full and harmonious taste. Excellent for Sur Lees due to high release of polysaccharides.



Available in 10 kg bags and 500 gram packs.

FERMOL BLANC

Delivers clean and vibrant wines, even in adverse conditions, with aromas of summer and stone fruit, with hints of citrus and floral. Also recommended for fruit wines, hard seltzers, ciders and mead.



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

Available in 10 kg bags and 500 gram packs.

SPARKLING YEAST COLLECTION

AEB yeasts for sparkling are recommended for base and sparkling wine production, but also for resumption of alcoholic fermentation. Their optimal temperature range is 65-70°F and they have low nitrogen needs. Please see "Chapter 9: Sparkling" for more information.

AROMATIC YEAST COLLECTION

Thiols are a class of organosulfur compounds much appreciated by consumers: 4MMP ("boxwood" and



"blackcurrant"), 3MH ("passion fruit", "grapefruit" and "citrus"), and 3MHA ("tropical", "passion fruit" and "rose"). Fermol Floral, Fermol Lime and Fermol Tropical were selected for their enhanced oenological features to boost varietal thiols aroma, but also to specifically increase the sensory perception of more neutral varieties.

Fermol line of yeast for thiols enhancement.

Scan the code to learn more about AEB yeast selection.



FERMOL FLEUR

consistently produces wines high in floral esters, containing aromas of white flowers, as well as notes of balsamic and mint perceived through the back of the nose.



FERMOL LIME

creates wines with strong levels of 3MH and citrus esters. Wines fermented with Fermol Lime produce aromas of grapefruit and citrus, with notes of aromatic herbs. Highly recommended for musts from warm regions where retaining acidity is crucial.



FERMOL TROPICAL

produces wines high in 3MH and 3MHA thiols, reminiscent of summer and tropical fruits with a hint of sage.



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

In the same research the formation of esters is what really distinguished the Fermol Lime and the Fermol Fleur from other standard products.

All the floral esters were highly present in the fermentation with Fermol Fleur. All the citrus esters were highly present in the fermentation with Fermol Lime.

Characteristics:

- Ideal fermentation temperature: between 55-62 °F/12-16 °C.
- Nutritional requirements: medium. With correct amino acid nutrition, the production of esters and aromatic acetates is increased. In some varieties, the aromatic profile is linked to the presence of specific precursors such as cysteine and glutathione, enhancing the aromas produced by this strain.
- Low malic consumption (<10%).

Available in 500 gram packs.

YEAST FOR REDS AND ROSÉ WINES

FERMOL PREMIER CRU

A strain very respectful of varietal aromatics, highlights red fruits and berries as well as aromatic herbs and spices. It produces high levels of polysaccharides, and actively extracts tannins and color from grape skins, making it the perfect yeast to obtain full-bodied, structured, and complex wines. Recommended for use in Pinot Noir, Merlot, Sangiovese, Cabernet Sauvignon and Syrah.

Available in 10 kg bags and 500 gram packs.

FERMOL MEDITERRANÉE

It is a strain suitable for the obtainment of warm, full-bodied wines, suitable for aging, but already very pleasant at the end of fermentation. Fermol Méditerranée is distinguished by its capacity to produce a high quantity of



polysaccharides and mannoproteins, which, besides harmonizing wine taste, rapidly induce stability in color and tannic structure. Highlights aromatic complexity of the varietal and produces aromas of ripe fig jam and small red berries, like cherries and red currant.

Available in 10 kg bags and 500 gram packs.

Winemaker's note: It has minimal or none SO₂ production, facilitating MLF. It also requires minimal YAN to complete the fermentation.

FERMOL RED FRUIT

Yeast developed in the same hybridization program of the Fermol Lime/Fleur/Tropical. It is designed for young red or rose wines when fresh esters and thiols are desired.



It is known to highlight aromatic notes of berries such as blueberry, black currant and raspberry, while still respecting varietal aromas unique to the grape. Low production of VA, ensuring wines retain aromatic freshness and great sharpness in the mouth.

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

Available in 10 kg bags and 500 gram packs.

FERMOL ROUGE

Recommended for the production of young reds and roses, and medium aged wines with good structure and intense berry aromas. This strain has an ability to bind coloring substances extracted during maceration, leading to wines with more intense color. Resistant to adverse conditions like hot fermentations and low nutrition.



Available in 10 kg bags and 500 gram packs.

FERMOL PB2033

Specific yeast for the vinification of rose and young red wines. It develops intense and persistent floral and fruity aromas. High production of glycerol and low color fixation, making it the best strain for lighter colored roses. Able to ferment at a wine temperature range (12-34 deg C).

Available in 10 kg bags and 500 gram packs.

FERMOL SUPER16

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

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

Available in 10 kg bags and 500 gram packs.

NON-CONVENTIONAL YEASTS

FERMOL COMPLETE KILLER FRU

Yeast strain selected for its killer factor and fructophilic characteristics, it is utilized to restart stuck fermentations in both red and white wines. Fermol Complete Killer Fru metabolizes the sugar fraction composed of Fructose while other strains leave it behind. It is also highly cryophilic and suitable for use in wines that are not at ideal temperatures. Produces floral aromas with hints of white fruit.

*See Helpful Hints section to learn how to use Fermol Complete Killer Fru to restart a stuck fermentation.

Available in 10 kg bags and 500 gram packs.

FERMOL ELEGANCE

A strain unable to process sulfur that can be picked up from the environment by yeast (excessive treatment of vineyard or harvested grapes with SO₂), preventing the production of H₂S. Creates wines with a wide range of aromas including floral and fruit with notes of citrus and aromatic herbs.

Available in 500 gram packs.

GLUTAFERM ONE

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

Available in 500 gram packs.

NON-SACCHAROMYCES YEASTS

WHAT ABOUT NON-SACCHAROMYCES YEASTS?

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

Levulia Alcomeno (Certified Organic): Belonging to the species *Lachancea thermotolerans*, a strain which carries out lactic fermentation from sugars producing wines that are fresh and balanced. This results in an increase of total acidity and lower alcohol content of the wine. *Levulia Alcomeno* can perform alcoholic fermentation up to 7% v/v of ethanol. It then requires sequential inoculation with another desired yeast.

Available in 500 gram packs.

Levulia Alcomeno winemaking trial 2020

Grapes from hot climates often contain excessive sugars and low acidity. This can result in wines with high alcohol content and lack of stability and

balance. The yeast *Levulia Alcolmeno* (*Lachancea thermotolerans*) can ameliorate such wines due to moderate lactic acid production from sugars during alcoholic fermentation.

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

Alcohol	13.19	%
pH	3.2	pH
Titrateable Acidity	7.09	g/L
Molecular SO2	0.36	ppm
Malic Acid	1.28	g/L
Residual Sugar	7.8	g/L
Volatile Acidity	0.44	g/L
Malic Acid	1.28	g/L
Residual Sugar	7.8	g/L
Volatile Acidity	0.44	g/L

Wine chemical parameters 02/01/2021.

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

Levulia Torula (Certified

Organic): a strain belonging to *Torulasporea delbrueckii* species, suitable for all types of grape varieties rich in terpenes and/or thiols due to its high enzymatic production (glucosidase and sulfur-lyase). It reduces the sensations of astringency on the palate thanks to its high release of polysaccharides; contributes greatly to the wines organoleptic complexity while limiting the production of volatile acidity. *Levulia Torula* can ensure alcohol fermentation up to 9% v/v ethanol and can be used alone, in co-inoculation or in sequential (24-48h) with the desired *S. cerevisiae*.



Levulia Torula winemaking trial 2020

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

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

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

*See helpful hints for rehydration and sequential inoculation protocols

BIOPROTECTION YEAST

Primaflora VR and VB (Certified Organic):

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



PRIMAFLORA APPLICATION

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

Do not use sulfites.

See helpful hints section for protocols on yeast rehydration and restarting stuck ferments

**Discover Bioprotection
with Primaflora.**

Scan the code to learn more.





CHAPTER 2

YEAST NUTRIENTS

WHY ADD YEAST NUTRIENTS?

- Fast start and vigorous fermentation
- High cell vitality and viability
- Increase ethanol tolerance
- De-novo biosynthesis of aromas
- Release of varietal aromas
- Lower H₂S production
- Off-flavors removal

REHYDRATION NUTRIENT

FERMOPLUS ENERGY GLU 3.0

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



- **Usage:** dissolve directly in the rehydration water along with the yeast.
- **Dosage:** 1:4 compared to yeast inoculum, i.e., 250 ppm of yeast will need 60 ppm of FermoPlus Energy Glu.
- **Packaging:** 1kg, 5 kg & 20 kg bags.
- **Shelf life and storage:** FermoPlus Energy Glu is stable at room temperature for at least two years.

WHY GLUTATHIONE DURING REHYDRATION?

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

Discover how rehydrating your yeast is with FermoPlus Energy Glu 3.0. It can help you boost the vigor of your yeast addition.

Scan the code to learn more.



VARIETAL NUTRIENTS

HOW TO ENHANCE THE BOUQUET OF WINES WITH AEB NUTRIENTS?

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

Features:

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

Enhance the bouquet of wines with our varietal nutrients.

Scan the code to learn more.



WHY ADDING AMINO ACIDS?

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



FERMOPLUS TROPICAL

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



- **Packaging:** 5kg bags

FERMOPLUS PROSECCO

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



- **Packaging:** 5kg bags.

FERMOPLUS FLORAL

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



- **Packaging:** 5kg bags

FERMOPLUS DAP FREE

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



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

FERMOPLUS SAUVIGNON

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

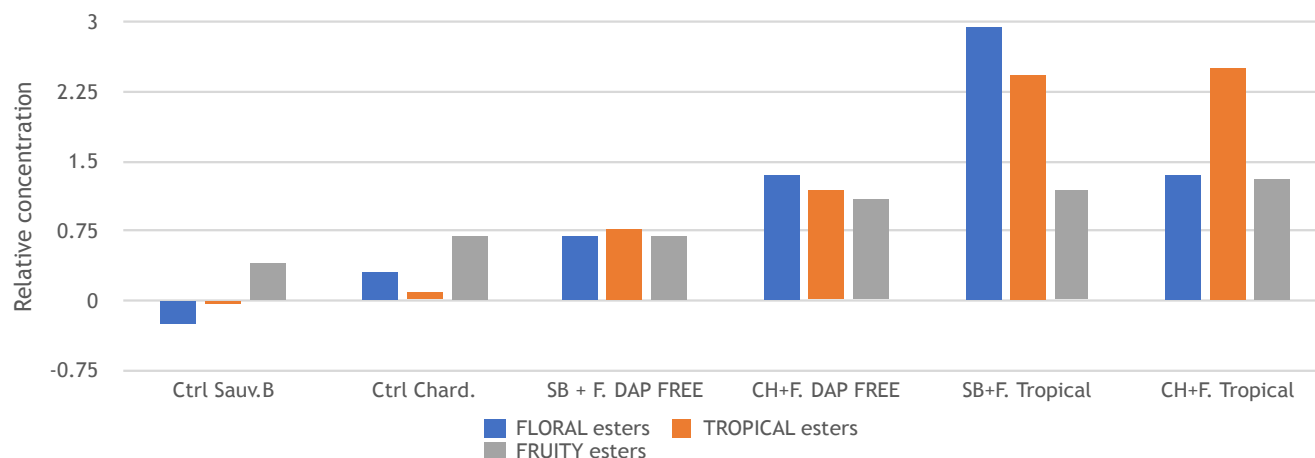


- **Packaging:** 5kg bag.
- **Usage:** Add at the beginning of the fermentation. 8-10 ppm YAN every 120 ppm.
- **Dosage:** standard addition is 20-40 ppm.
- **Shelf life and storage:** stable at room temperature for at least two years.

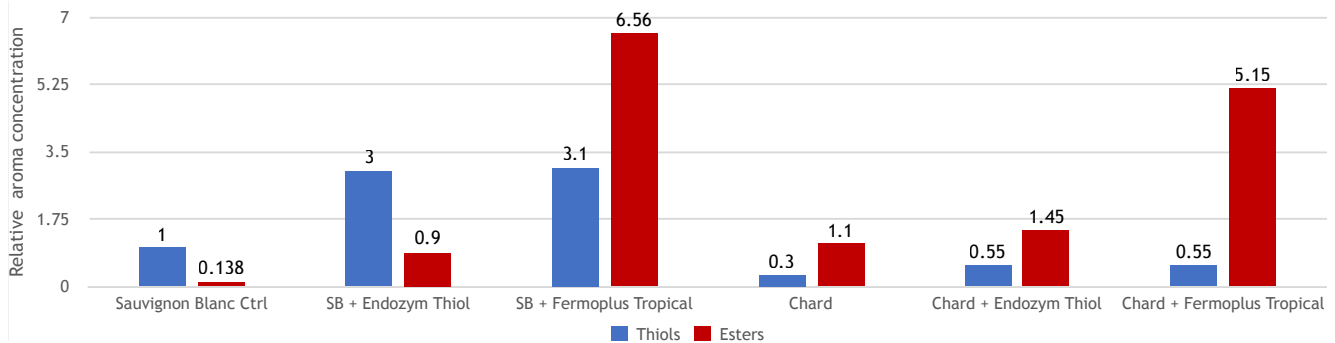
FERMOPLUS PYROFF

Fermoplus PyrOff is a 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.

Total Esters Compounds



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



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

Lysate promotes vigor fermentation and the aroma production of the yeast. The cell walls are essential for adsorbing methoxypyrazine, which is responsible for green/bell pepper notes in Cabernet Franc, Cabernet Sauvignon, Merlot, Pinot Noir, Sauvignon Blanc, Chardonnay, and Riesling.

- **Usage:** Add Fermoplus PyrOff right after pectolytic enzymes have finished their activity. It causes the methoxypyrazines released from the skins to be immediately adsorbed and subsequently eliminated.
- **Dosage:** 200-800 ppm. Adds 4 ppm of YAN every 120 ppm.
- **Packaging:** Available in 5 and 20 kg bags.

Fermoplus PyrOff

Scan the code to learn more.



FERMENTATION NUTRIENTS

FERMOPLUS INTEGRATEUR

Complex nutrient based on DAP and yeast lysate. It has a high NH₄ content to quickly increase the YAN. It also has all the benefits of yeast extract, including a boost in aromatics given by the amino acidic content, vitamins, trace elements, and sterols to keep the yeast healthy.



- **Dosage:** 120 ppm adds 18 ppm of YAN.
- **Packaging:** 1kg vacuum-sealed packs, 5 and 20 kg bags.

AUXILIA

Yeast nutrient certified for organic wine production which improves the fermentation chances to finish and decreases the production of volatile acidity from yeasts. It also improves the fermentability of sparkling wine bases by adsorbing fermentation inhibitors.

- **Packaging:** 1kg bags.

FERMOPLUS BLANC VARIETAL

Contains specific natural antioxidants (ellagic tannins) and amino acids in order to enhance and protect white wine aromatics.

- **Usage:** 120 ppm adds 13 ppm of YAN.
- **Packaging:** 5 kg bags.

FERMOPLUS PREMIER CRU

Contains natural mannoproteins, ellagic tannins, amino acids and B vitamins for enhancing the varietal qualities of red wines.

- **Dosage:** 120 ppm adds 14 ppm of YAN.
- **Packaging:** 5 kg bags.
- **Enovit P:** Mainly composed of nitrogen salts of DAP with added Thiamin. It brings a large amount of ammonia (NH₄) for a quick boost of the YAN.
- **Dosage:** 120 ppm adds 24 ppm of YAN (about 20%).
- **Packaging:** 25 kg bags.

- **Usage:** 200-400 ppm divided in 2-3 staggered additions.
- **Shelf life and storage:** Stable at room temperature for at least two years.

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

WHY ADDING THIAMINE TO NUTRIENTS?

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

FERMENTATION AIDS

FERMOCEL P

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

- **Dosage:** standard addition is 120-360 ppm (12-36 ppm YAN)
- **Packaging:** 25 kg bags.

CELLOFERM

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

Dosage: 120-240 ppm.

Packaging: 10 kg bags.

- **Usage:** make a slurry in 20 parts of must or stuck wine and add to the tank right after having pitched the yeast.
- **Shelf life and storage:** sealed containers are stable at room temperature for at least two years.

YEAST NUTRIENTS ADDITION PROTOCOL

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

Fermentations prolonged using low temperatures (<12 C) will need about 20% extra YAN.
4. Target your YAN with DAP containing nutrients at 1/3 of the fermentation (e.g. 100-200 ppm Fermoplus Integreur or Enovit P).
5. If the fermentation is sluggish or stuck, consider adding 100-200 ppm Fermocel P or Celloferm.

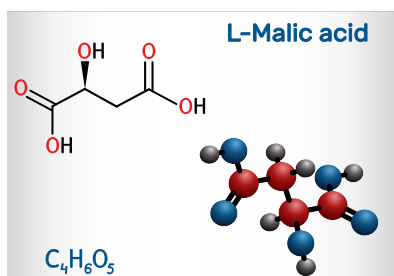
CHAPTER 3

ML SECONDARY FERMENTATION

MALOLACTIC BACTERIA

WHAT IS MALOLACTIC FERMENTATION?

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



MLF is generally carried out by a species of lactic acid bacteria: *Oenococcus oeni*. By inoculating with an AEB starter culture, the winemaker can reduce the

risk of potential spoilage bacteria, promote the rapid start and completion of MLF, and encourage a positive flavor contribution.

MALOLACT ACCLIMATÉE

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

MALOLACT ACCLIMATÉE 4R

Ideal for big red wines and harsh ML conditions: the selection has been mostly focused on having a strain resistant not only to harsh conditions (pH: 3.2; Temperature: 18 °C/64°F; Alcohol level: 14.5%; Total SO₂ 60 ppm) but also to high levels of tannins (TPI 80).

MALOLACT RAPID

a new *Oenococcus oeni* culture in a high-performance, freeze-dried form. Decades of research into the best biomass production techniques has resulted in the nutrients and protective substances used in bioreactors being carefully selected to obtain a vigorous culture that is resistant to fermentation stress.

FROZEN CULTURE AT -20°C.

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

Dosage and packaging: Pre-dosed packets for 2.5 hectoliters, 25 hl, 250 hl and 1000 hl.



MLB NUTRIENT

FERMOPLUS MALOLACTIQUE

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

- **Utilization:** dissolve dose in wine to be treated, along with the dose of malolactic bacteria.
- **Dosage:** 5-20 g/hl. Higher dosage is for when used for co-inoculation.
- **Packaging:** 500 gram packs and 5 kg bags

MALO LACTIC FERMENTATION CONDITIONS

Factors and values that influence Malolactic fermentation.

	Simple conditions	Challenging conditions	Difficult conditions	Extreme conditions
Alcohol (%vol.)	<13	13-15	15-17	>17
pH	>3,4	3,1-3,4	2,9-3,1	<2,9
Free SO ₂	<8	10-12	12-15	>15
Total SO ₂	<30	30-40	40-60	>60
Temperature (°C)	18-22	Low: 14-18	Low: <14	Low: <10
		High: 18-24	High: >24	High: >29
Initial malic acid (g/L)	2-4	High: 4-5	High: 5-7	High: >7
		Low: 1-2	Low: 0,5-1	Low: <0,5

CHAPTER 4

ENZYMES FOR WINEMAKING

THE IMPORTANCE OF ENZYMES

Enzymes are proteins that are naturally present both in the skin and the pulp of the grape that accelerate the vinification process. The enzymes facilitate reactions, but are not themselves consumed. Their main use in winemaking is to reduce the size and impact of pectins, glucans and glycosides. These are long chain molecules found in the non-woody parts of grapevines as well as many plants. When enzymes are added, they are broken down in size and better clarification and stability can be achieved.

PECTINS

Pectins are a polymers of polygalacturonic acid composed of the D-galacturonic acid monomer units that is an oxidized form of the sugar galactose. Pectins form a gel when in liquids. The addition of pectinases break down by cutting the long chains of pectins into smaller lengths. This action inhibits the gelling activity and the viscosity is thereby decreased.

GLUCANS

Glucans are a polysaccharides composed of D-glucose monomers. The mold *Botrytis cinerea* produces glucans when it infects grapes. Similar to pectin activity, glucans increase the viscosity of the wine and make it harder to process and filter wine. The addition of Beta-glucanase cuts the length of the glucans so filtration is much more easily achieved.

GLYCOSIDES

Glycosides can contain aromatic molecules called terpenes that are bound to a glucose molecule. The addition of Beta-glucosidase catalyzes the hydrolysis of glycosidic bonds to release the terpenes as well as C13-noriosprenoids, so a greater aromatic profile can be enhanced in the wine.



FACTORS THAT AFFECT ENZYMATIC ACTIVITY

- Lower temperatures decrease the activity of an enzyme. Conversely, at high temperatures the protein structure of an enzyme is compromised and it is denatured or destroyed. The ideal temperature range is 56-60F and.
- The longer time period an enzyme is left to work, the more work it can do.
- pH below 3.2
- Sugar content greater than 50g/L
- Bentonite usage absorbs proteins and therefore inactivates enzymes.

SHELF LIFE AND STORAGE

Stable at room temperature for at least two years, with a loss less than 5% per annually, beginning in year 3.

Why is it important to choose the right wine enzyme?

Scan the code to learn more.



WHITE MUST CLARIFICATION ENZYMES

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

ENDOZYM ACTIVE

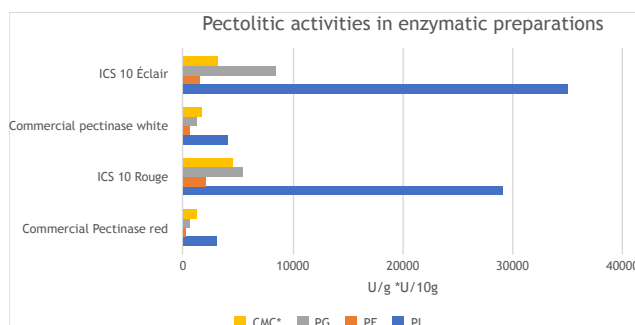
Granular Pectinase

- **Dosage:** 20-40 grams per ton of grape depending on contact time, temperature and SO₂ content.
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 500g can.

ENDOZYM MUSCAT

Granular Pectinase, for difficult to clarify varieties

- **Secondary:** Arabinase and rhamnosidase allowing for quick removal of pectin
- **Dosage:** 20-40 grams per ton of grape depending on contact time, temperature and SO₂ content.
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 500g can.



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

ENDOZYM E-FLOT

Liquid Pectinase, for use in flotation

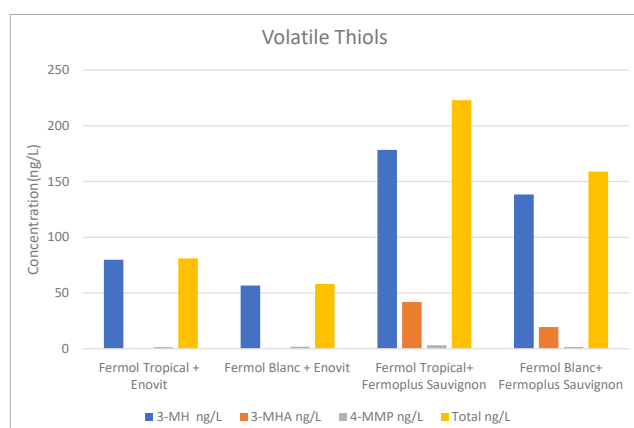
- **Dosage:** 5-10 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 10 kg pails.



ENDOZYM ICE

Liquid Pectinase, for use in colder temperatures to maximize varietal aromas and assist in clarification of must obtained by cold maceration.

- **Dosage:** 2-6 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 1 kg plastic bottle.



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

ENDOZYM ICS 10 ÉCLAIR

Liquid Pectinase for rapid clarification with longer shelf life due to high concentration

- **Dosage:** 1.5 to 5 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 250 ml & 1kg plastic bottle.



ENDOZYM MICRO

Liquid concentrate Pectinase used to accelerate the clarification musts.

- **Dosage:** 2-6 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of

non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.

- **Packaging:** 10kg & 25kg plastic bottle.

WHITE MUST CLARIFICATION ENZYMES/AROMA ENHANCEMENT

ENDOZYM CAT-O

Liquid Pectinase that extracts free aromatic compounds & aroma precursors, without extracting oxidizable polyphenols

- **Dosage:** 2-6 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 10kg & 25kg plastic bottle.

ENDOZYM CULTIVAR

Granular Pectinase used for cold maceration of white grapes best used at the press or to the must prior to cold settling. It weakens cell walls, facilitating aroma extraction and yields a high β -glucosidase activity.

- **Secondary:** high β -Glucosidase activity for terpene release
- **Dosage:** 2 to 6 ml per ton of grapes
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to must or directly onto the grapes.
- **Packaging:** 500g can.



GLUCANASE & AROMA ENHANCING ENZYMES



ENDOZYM β -SPLIT

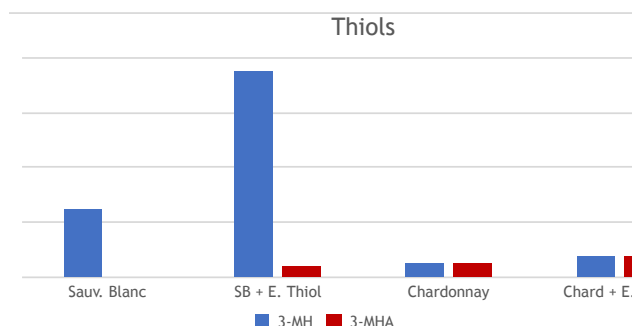
Granulated beta-glucosidase specific for terpenes release and aroma enhancement.

- **Dosage:** 2-5 g/hl depending on contact time, temperature and SO₂ content
- **Application:** Dissolve directly in 20-30 parts of non-sulfurized must or in demineralized water, then add either mid-way through the fermentation or to the finished wines before bentonite addition.
- **Packaging:** 500g can.

ENDOZYM THIOL

Liquid carbon-sulfur lyase reminiscent of grapefruit, passion fruit, and box-tree.

- **Dosage:** 2-4 g/hl ppm depending on time, temperature, and SO₂ content.
- **Application:** Add to the fermenting tank halfway through fermentation. (Use Elevage Glu to protect the newly formed aromatics from oxidation).
- **Packaging:** 1 liter bottles



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

ENDOZYM GLUCAPEC:

Granular β -glucanase enzyme to facilitate filterability in wines rich in glucans, like the ones obtained from Botrytis infected grapes.

- **Dosage:** 2-4 g/hl (lower dosages are best with higher temperatures).
- **Application:** Dilute in 20-30 parts of wine with low SO₂ or de-mineralized water. Add directly to the wine. The addition must be carried out at the end of the alcoholic fermentation since the enzyme is strongly inhibited by the action of the yeasts. Ideally, this enzyme should be utilized between 60 and 78°F (16-24 °C) and is never to be used in conjunction with bentonite.
- **Packaging:** 500g can.

MACERATION ENZYMES

ENDOZYM CONTACT PELLICULAIRE:

Granular maceration/color-extraction enzyme.

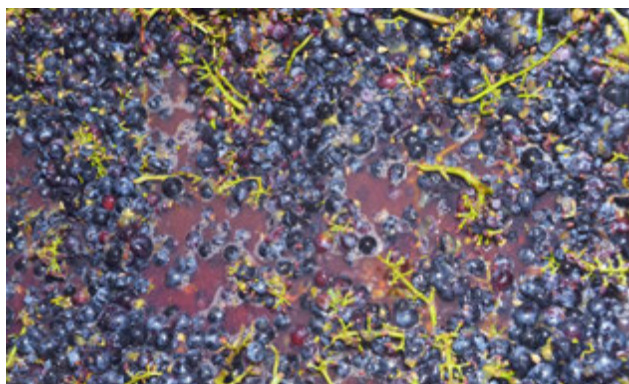
- **Secondary:** cellulase and hemicellulase activities, speeds-up the color extraction process, decreases maceration time, and consequently prevents the extraction of unwanted bitter tannins.
- **Dosage:** 20-40 grams per ton of grapes depending on contact time, temperature and SO₂ content.
- **Application:** dilute directly in 20-30 parts of non-sulfurized must or de-mineralized water and add to the grapes/must.
- **Packaging:** 500g vacuum-sealed cans.



ENDOZYM ICS 10 ROUGE

High concentrated liquid maceration and color extraction enzyme.

- **Secondary:** cellulase, polygalacturonase and hemicellulase for rapid color and phenolic extraction
- **Dosage:** 1 to 3 ml per ton of grapes
- **Application:** 20-40 grams per ton of grapes depending on contact time, temperature and SO₂ content.
- **Packaging:** 250 ml & 1kg plastic bottle.



ENDOZYM ROUGE DEEP SKIN

Enzyme for processing varieties that have thick skins to reduce solids content during pressing, allows for less maceration time and maximizes polyphenolic extraction as well as varietal aroma expression.



- **Dosage:** 10-20 ml per ton grapes.
- **Application:** at the first pump over, right before fermentation starts, and when the temperature is above 60°F-18°C. The product should be diluted in 20-30 parts of sulfur-free must or in de-mineralized water. Higher doses must be used for grapes with low pH and cultivars, or vintages for which the extraction of color might be particularly difficult.
- **Packaging:** 1kg plastic bottle.

ENDOZYM ROUGE LIGHT SKIN

Enzyme for processing varieties that have fine/thin skins ensure good color extraction with minimal solids production.

- **Dosage:** 10-20 ml per ton of grapes.
- **Application:** at the first pump over, right before fermentation starts, and when the temperature is above 60°F-18°C. The product should be diluted in 20-30 parts of sulfur-free must or in de-mineralized water. Higher doses must be used for grapes with low pH and cultivars, or vintages for which the extraction of color might be particularly difficult.
- **Packaging:** 1kg plastic bottle

SPECIALTY ENZYMES

ENDOZYM ANTIBOTRYTIS

Granular enzyme cocktail, including β -glucanase to reduce impact of mold, s.a. Botrytis cinerea.

- **Dosage:** 30-50 grams per ton of grapes or 20-40 g/hl in wine. Treatments of musts or wines with a high infection, low temperature and high sugars need the higher dosages.
- **Application:** Dilute directly in 20-30 parts of non-sulfurized must or in de-mineralized water and add to must or wine. To guarantee pectin hydrolyzation and color extraction, Endozym Antibotrytis should be used in association with normal clarification or color extraction.
- **Packaging:** 500g vacuum-sealed can.
- **Maceration enzymes:** guarantee higher extraction efficiency, thus reducing maceration time.

MICROBIAL STABILITY ENZYMES

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

LYSOCID W

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

- **Dosage:** to prevent Lactobacillus in grapes: 10-25 g/hl. To stabilize Lactobacillus during slow or stuck fermentation: 25-40 g/hl.
- **Application:** dissolve 1:10 ratio of Lysocid W in water, juice, or wine, and add uniformly to musts or wines. Do not treat with bentonite or other fining agents for 24 hours after addition to avoid inactivation of the enzyme.
- **Packaging:** 1kg packs

ENZYMES FOR FLASH-DÉTENTE TECHNOLOGY AND THERMOVINIFICATION

ENDOZYM TMO

Liquid pool of enzymatic activities for clarification of heat extracted musts.

Secondary activities intervene on pectic chains present in the skin. These molecules heavily interfere with the brightness of the processed must and are usually harder than normal to degrade. Endozym TMO displays optimal temperatures for grapes coming out of thermo and is ideal to remove clogging pectins and polysaccharides.

- **Dosage:** from 2-4 g/hl.
- **Application:** Dilute directly in 20-30 parts of must, to which no sulfur has been added, or demineralized water. The product should be used immediately after the thermal treatment and after temperature has lowered under 104°F/40°C.
- **Packaging:** 1 kg bottle and 10 kg pail

CHAPTER 5
TANNINS

WHAT ARE THE FUNCTIONS OF ADDING TANNINS DURING WINEMAKING?

AEB has tannin preparations that when added to a must, juice, or wine, can improve the stability, modify the structure, color, composition, aromatics and overall mouthfeel characteristics. For addition purposes and timing, there are specified tannins that are best classified to fermentation, maturation and the finishing phases of a wine.

The addition of enological tannins during fermentation provides the primary role of being 'sacrificial'. If added at the beginning of vinification, these tannins interact with reactive proteins and other grape components forming an insoluble compound and precipitating out into the lees. Because the enological tannins are prone to these reactions, the natural grape tannins are then protected and free to combine with anthocyanins to form condensed pigments and increase color stability.

Maturation tannins play a fundamental role in the development of a wine throughout the cellaring period. They will greatly aid in ensuring a correct aging of the wine. These tannins are highly reactive towards oxygen and therefore help to protect against excessive oxidation during this development period. They also have a great ability to add needed oak aromas, flavors, enhance mouthfeel and improve the general composition of a wine.

Finishing tannins are condensed tannins that are highly responsive to their purpose in a wine. They can immediately contribute that last touch to a wine to elevate it to a new level of quality and allow its true characters to shine through. Finishing tannins will prolong aromatic complexity, increase structure, allow flavors to further develop and help the wine to be fresher and livelier on the palate.

AEB has a wide range of enological tannins to help achieve all these winemaking goals and to elevate any wine to its fullest potential!



FERMENTATION TANNINS

FERMOTAN: Vinification tannins with antioxidant and color stabilization properties.

- **Dosage:** average dosages in red must range 12-96 g/hl
- **Packaging:** 1 kg packets, 15 kg bags.

FERMOTAN LIQUID: Vinification tannins with antioxidant and color stabilization properties.

- **Dosage:** average dosages in red must range 10-80 ml/hl
- **Packaging:** 5 kg bottles, 25 kg drum.

GALLOVIN

Sacrificial tannin, highly reactive with proteins to protect from oxidation, including botrytis infection. Gallovin is a colorless and odorless product which will not affect wine flavors, but will reduce the need for antioxidants such as SO₂ and ascorbic acid.

- **Dosage:** Average dosage range in musts is 12-36 g/hl. Add about 200 ml per ton of grapes.
- **Packaging:** 500 g and 5 kg bags

GALLOVIN LIQUID

Sacrificial tannin, highly reactive with proteins to protect from oxidation, including botrytis infection. Gallovin is a colorless and odorless product which will not affect wine flavors, but will reduce the needs for antioxidants such as SO₂ and ascorbic acid.

- **Dosage:** Average dosage range in musts is 10-30 ml/hl Add about 200 ml per ton of grapes.
- **Packaging:** 25 kg pales.

FERMOTAN BLANC

Stops the progressive darkening of oxygen-rich white musts, without increasing their color, adds an “oaky” structure and preserves the aromatic freshness for a longer period. Fermotan Blanc allows winemakers to reduce significantly SO₂ addition.

- **Dosage:** 5 to 40 g/hl in white musts.
- **Packaging:** 1 kg packets

TANÉTHYL EFFE

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



- **Dosage:** rosé wines: 4 to 12 g/hl. Red wines: 12 to 36 g/hl.
- **Packaging:** 1 kg packets.
- **Utilization:** Mix 1:10 in a separate tub with warm water (95°F/35°C) and then add to the grapes or to fermenting must during pump over.
- **Shelf life and storage:** it can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place



AEB INTRODUCES A NEW CONCEPT OF FERMENTATION TANNINS: VARIETAL SPECIFIC TANNINS

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

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

FERMOTAN CB

A mix of proanthocyanidinic tannins obtained from grape skins, grape seeds, and quebracho to stabilize anthocyanins and consequently fix the color in varieties with an anthocyanin profile like that of Cabernet, Merlot, Toroldego, Montepulciano, Barbera.

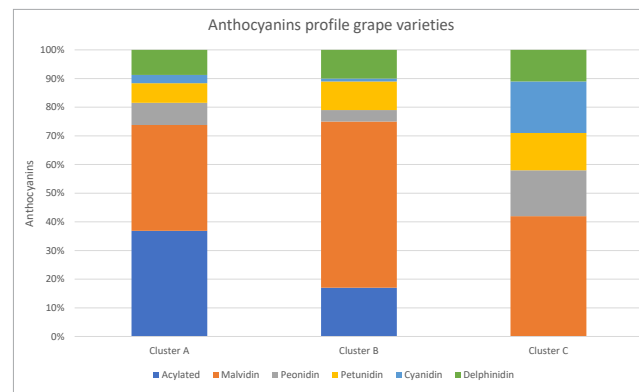
FERMOTAN AG

A balanced blend of wood and skin proanthocyanidins and ellagic tannin extracted from oak, with a slightly astringent flavor and boisé notes. The tannin helps reach the correct amount of reactive proanthocyanidins to stabilize the color for varietals similar to Aglianico, Nero d'Avola, Primitivo, Zinfandel, Malbec, Tempranillo, Syrah.

FERMOTAN SG

A balanced mix of ellagic and wood proanthocyanidinic tannins that softens the pallet and helps color preservation for Sangiovese and Pinot Noir.

- **Dosage:** From 6-40 g/hl.
- **Application:** Mix 1:10 in a separate tub with warm water (95°F/35°C) and then add to the grapes or to fermenting must during pump the earliest stages of vinification.
- **Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place.
- **Packaging:** 1 kg net/ 5 kg net bags.



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

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

MATURATION TANNINS



ELLAGITAN EXTREME

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

- **Dosage:** 12-50 g/hl .
- **Packaging:** 500g packets.

ELLAGITAN ROUGE

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

- **Dosage:** 5-60 g/hl.
- **Packaging:** 5 and 25 kg net bags.

ELLAGITAN REFILL

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

- **Dosage:** Average dosages range 10-60 ml/hl
- **Packaging:** 1 kg bottles and 25 kg pales.

TANIBLANC

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

- **Dosage:** red wines: 12-50 g/hl ; rosé wines 12-25 g/hl; white wines 6-12 g/hl.
- **Packaging:** 1 kg packets.

TANIQUEERC

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

- **Dosage:** 12-50 g/hl.
- **Packaging:** 1 kg packets and 15 kg bags.

PROTAN AC

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

- **Dosage:** 5-40 g/hl.
- **Packaging:** product available upon request in 1 and 5 kg bags.

PROTAN Q BIO

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

- **Dosage:** 10-50 g/hl.
- **Packaging:** product available upon request in 5 kg bags.

PROTAN BOIS

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

- **Dosage:** 5-50 g/hl. Because of the powerful structure of this tannin, it is recommended to wait 15 days for full integration and for optimal results.
- **Packaging:** 1kg and 5kg packets.

PROTAN MALBEC

Powdered proanthocyanidinic tannin extracted from Malbec seed. It gives red wines a sweet but strong backbone structure and color stability.

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

- **Dosage:** Whites: 3-12 g/hl. Reds: 12-40 g/hl.
- **Packaging:** 500 gram packets.

PROTAN PEPIN OXILINK:

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

- **Dosage:** whites: 3 to 12 g/hl. Reds: 10-50 g/hl.
- **Packaging:** 500 gram packets

PROTAN PEEL:

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

- **Dosage:** for whites 3 g/hl are a good start for light varieties like Sauvignon Blanc, Chenin, or even French Colombard. In Reds start with 10-50 g/hl. The higher dosages are recommended in fermentation.
- **Packaging:** 1 kg bottle and 10 kg pales

PROTAN RAISIN

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



- **Dosage:** whites: 3-12 g/hl; reds: 10-50 g/hl. When adding Protan Raisin in a bench trial, wait for at least 3 days to evaluate.

- **Packaging:** 500 gram packets

TANÉTHYL

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

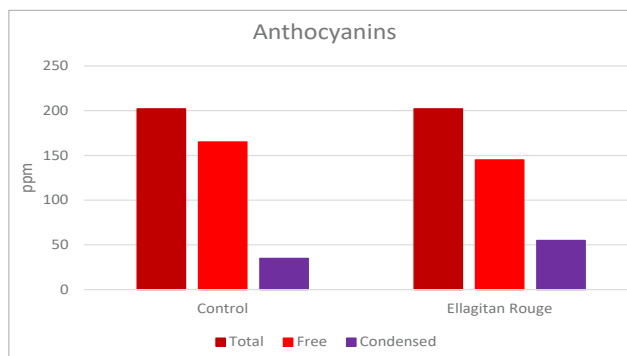
- **Dosage:** rosé wines: 5-15 g/hl; red wines: 12-36 g/hl.

- **Packaging:** 1 kg packets

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

Wait at least a week before filtering.

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



Ellagitan Rouge promotes anthocyanins stability through polymeric pigment formation.

ELLAGITAN BARRIQUE ROUGE

Granulated tannin from highly toasted oak wood. It prolongs the aromatic persistency, improves the mellowness of wines, and integrates their aromatic complexity with delicate nuances reminiscent of chocolate and vanilla.

- **Dosage:** Minimum dosage for light nuances in reds is 10 g/hl . Higher dosage will increase its impact.

In whites, it may be dosed at 3-12 g/hl.

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

ELLAGITAN BARRIQUE BLANC

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

- **Dosage in white wines:** 6-50 g/hl.

- **Packaging:** 500 gram packets.

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

- **Wait at least a week before filtering.**

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

FINISHING TANNINS



ELLAGITAN BARRIQUE LIQUID

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

- **Dosage:** Average dosages range 10-60 ml/hL. Minimum dosage for light nuances in reds is 10 ml/hl. Higher dosage will increase the impact. In whites, it may be dosed at 3-10 ml/hl.
- **Packaging:** 1 kg bottles, 10 kg pails.

EB BERRY MIX

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



Dosage: Average dosages range 10-60 ml/hL. Minimum dosage for light nuances in reds is 10 ml/hl. Higher dosage will increase the impact. In whites, it may be dosed at 3-10 ml/hl.

- **Packaging:** 1 kg bottles, 10 kg pails.

EB FRUIT RESERVE

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

- **Dosage:** Average dosages range 10-60 ml/hL. Minimum dosage for light nuances in reds is 10 ml/hl. Higher dosage will increase the impact. In whites, it may be dosed at 3-10 ml/hl.
- **Packaging:** 1 kg bottles, 10 kg pails.

EB GOUD-RON

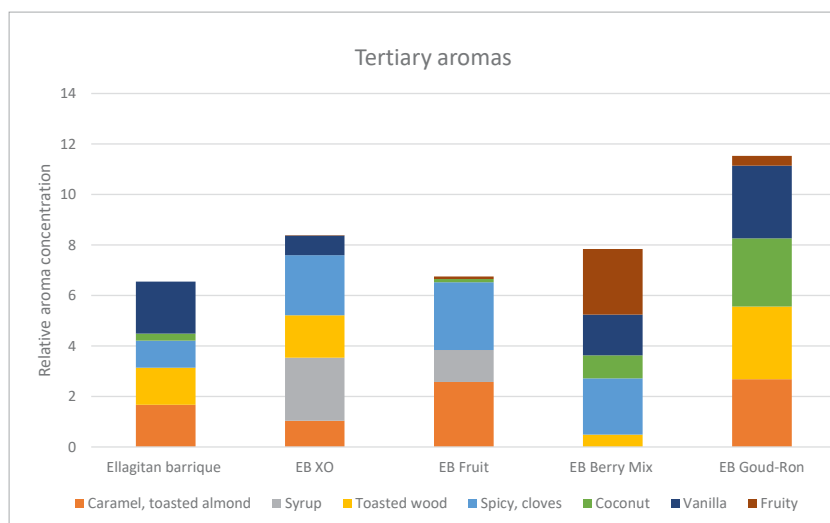
Helps stabilizing the color, but also introduces a soft note that adds structure and smoothness. In the nose, it shows notes of “goudron” (tar), a typical descriptor of old-world wines, reminiscent of the ones found in the great reds from rhône and piedmont.

- **Dosage:** Average dosages range 10-60 ml/hL. Minimum dosage for light nuances in reds is 10 ml/hl. Higher dosage will increase the impact. In whites, it may be dosed at 3-10 ml/hl.
- **Packaging:** 1 kg bottles, 10 kg pails.

EB XO

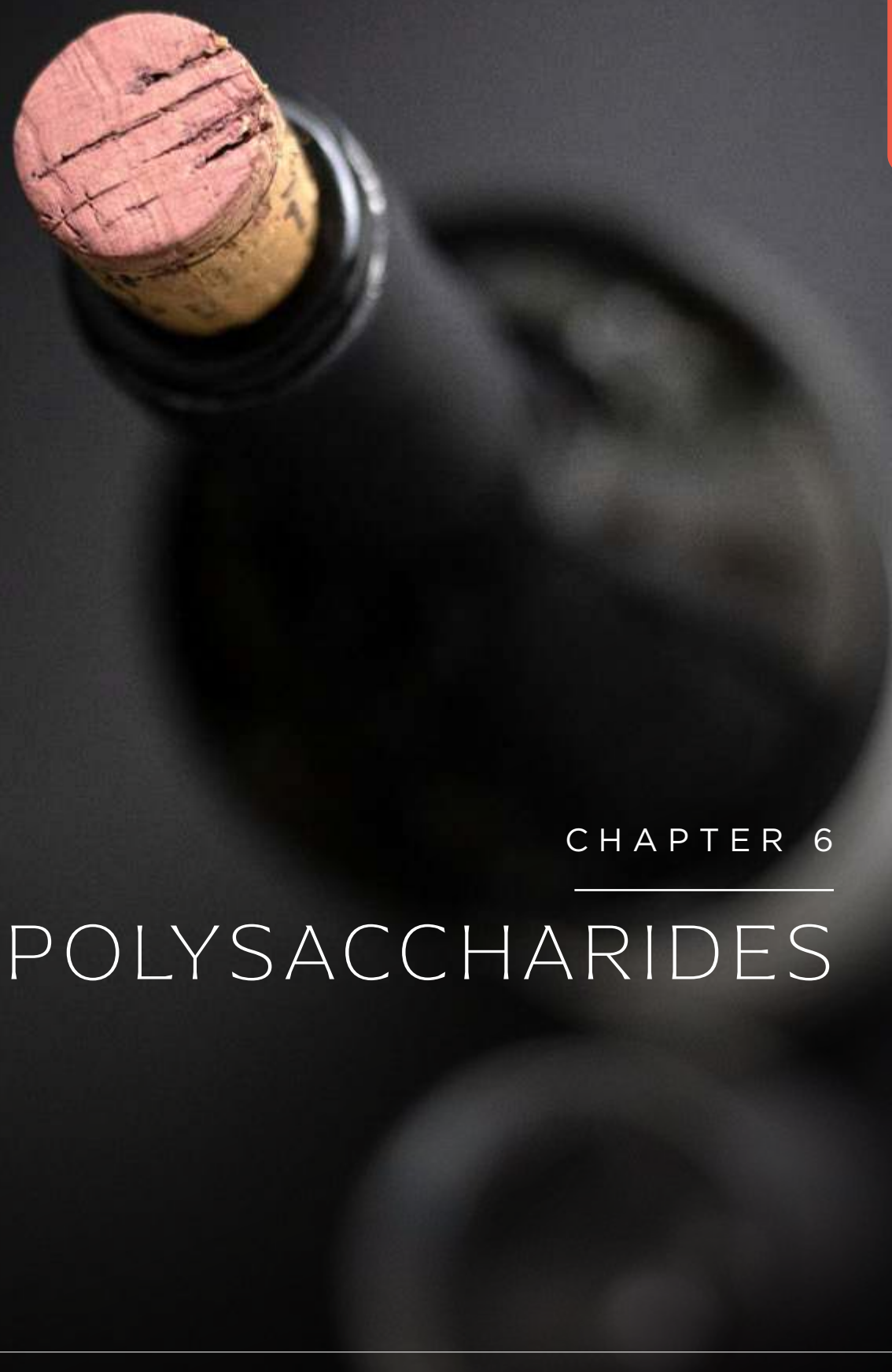
Gives a smoky/toasted note that works great for wines where we want to enhance the spices, chocolate, leather, and earthy sensations. Not recommended in smoke tainted or Brett-affected wines. It helps hide most other defects, like burnt rubber or methoxypyrazines.

- **Dosage:** Average dosages range 10-60 ml/hL. Minimum dosage for light nuances in reds is 10 ml/hl. Higher dosage will increase the impact. In whites, it may be dosed at 3-10 ml/hl.
- **Packaging:** 1 kg bottles, 10 kg pails.
- **Utilization:** dilute in 10 parts of wine and add to fermentation or at any other stage. It is better to avoid additions 2 weeks before micro-filtration. Sediments in the bottle are normal occurrences which could be dissolved in wine or hot water.
- **Shelf life and storage:** can be kept for three years in the original sealed packaging away from light, and in a cool, dry, odor-free place.
- **Packaging:** 1 kg bottles, 10 kg pails.



Ellagitan barrique line is derived from quality American and/or French oak; these tannins can impart welcome notes of coconut and vanilla, perception of sweetness, and a very aromatic profile, depending both on the source of wood and on the toasting levels of a finished wine. Ellagitan barrique line can also be used to extend the life of used barrels. It offers numerous advantages over other oak alternatives: it is immediately soluble, does not release undesirable substances, such as resins or bitter compounds, and inhibits bacteria or mold contamination, thus reducing the need for SO₂. Furthermore, there is no color or wine loss due to wood absorption.





CHAPTER 6

POLYSACCHARIDES

The contribution of polysaccharides to wine can be divided into three groups: those that are contained within the grapes, those that are released by microorganisms, and those that are derived naturally from plants. The role of all of these sources is to enhance both the stability and the quality of wine. By the traditional winemaking method of cold maceration, implementing macerating enzymes, and ageing the wine sur lie, increasing the content of polysaccharides is possible.

However, the disadvantages of this course are time constraints, vessel space and potential off aromas and flavors imparted by the lees. To avoid these problems, plant and yeast polysaccharides can be added to maximize protein, color and tartrate stability and with the added benefit to enhance the quality of wine.

Plant polysaccharides used in wine come in the form of Gum Arabic. Here AEB offers the Arabinol

range. These are natural stabilizers effective in keeping color in suspension. They will help prevent iron and copper casse, as well as the formation of microcrystals of tartar. In addition to bringing volume and roundness to a wine, they have a significant effect on reducing both astringency and bitterness.

Yeast polysaccharides are the product of yeast cells that are rich in peptides, mannoproteins and antioxidant amino acids. The AEB line of polysaccharides take advantage of all of these constituents to increase protein stability, improve free anthocyanin co-pigmentation, greatly increase antioxidant capacity and reduce the need for SO₂. To the palate, these AEB polysaccharides have a great impact on elevating the volume, viscosity, structure, flavors, aromas and overall composition of wine.



PLANT POLYSACCHARIDES: GUM ARABIC



ARABINOL

Slows down aggregation of crystals of tartrates and diminishes the perception of astringent and bitter tannins. It can be used on whites and reds in case of need to improve viscosity and sweetness. When added to sparkling wines, Arabinol improves the finesse of the perlage. In young red wines and rosé, it also improves color stability.

- **Dosage:** 50-200ml/hl
- **Packaging:** 10 or 25 kg pails and 230 kg drums.

ARABINOL HC

A solution of about 33.5% gum Arabic, mostly composed of polysaccharides rich in D-galactose, which contributes to the softness and sweetness of the mid-palate in the wines treated. The characteristics of this premium gum Arabic are higher softening and stabilizing power.

- **Dosage:** 30-150ml/hl.
- **Packaging:** 1 kg bottles and 25 kg pails.

ARABINOL SUPER ROUGE

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

- **Dosage:** 20 to 150 g/hL. 1000 ppm will bring 4 ppm of SO₂ to the wine.
- **Packaging:** 25 kg net drums.

Gum Arabic

Scan the code to learn more.

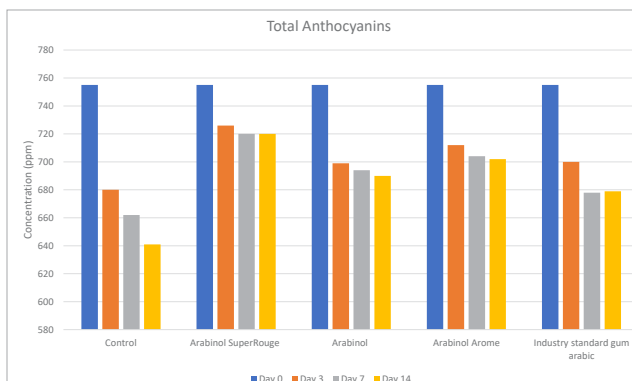


ARABINOL ARÔME

A blend of different Arabic gums, Arabinol Arôme is formulated to retain fresh and fruity characteristics in wine and to preserve all the aromatics naturally present in the bouquet of red, white and rosé wines.



- **Dosage:** 50-200ml/hl
- **Packaging:** 10 and 25 kg pail
- **Utilization:** dilute 1:10 in wine to improve homogenization. Best timing for addition is after ML and before bottling. It is suitable for wines that undergo membrane filtration. Do not add right before clarification because treating wines with polysaccharides before bentonite and fining agents can slow down their settling. It is suggested to carry out a filterability test before submitting the wine to a membrane or crossflow filtration.
- **Shelf life and storage:** once opened, it should be used within 30 days. If a container is left open for a longer time, add 1000 ppm of SO₂ to extend life span.



In order to evaluate color stability, tests have been done on red wines: the test which has been carried out focuses on the measurement of the coloring matter before and after resting for 14 days at +4°C to simulate and accelerate the loss of color over time.

	$\Delta\mu s$	Result
Chianti Control	85,5	instable
Chianti+100g/hL Arabinol Super Rouge	55,3	Stable/Slightly instable
Chianti+100g/hL Arabinol Arome	46,7	Stable
Chianti+100g/hL Arabinol	40,3	Stabile
Chianti+100g/hL Arabinol HC	38,7	Stabile

Evaluation of tartaric stability measuring changes in conductivity. Test duration: 4 minutes.

	VMAX	Filtrability Index	Results
Red wine control	6000	3	=
Arabinol HC	4084	5	++
Arabinol	3813	6	++
Arabinol Arome	3019	14	-
Arabinol Super Rouge	2820	16	-

Filtrability is expressed as VMAX and filterability index as a result of the filtration test. The sample passes through a 3.9 cm² (25 mm diameter) membrane of 0.65µm porosity, under a constant pressure of 2bar. VMAX<4000 and IF>10 = slow.



ARABINOL BIO D

Arabinol Bio D is an instantly soluble, refined and micro-granulated gum Arabic, produced in accordance with organic regulations. The molecule dimensions of Arabinol Bio D, larger than 500 Kd, facilitate the stabilizing action of the gum Arabic in wines, interacting with the tactile sensations of the taste. Arabinol Bio D wraps up tartaric crystals and keeps them soluble. Thanks to the dimensions of its molecule, it is more easily filterable if compared to similar commercial preparations. It does not contain SO₂ or other preservatives.

- **Dosage:** 10–30 g/hl. .
- **Packaging:** product available upon request in 1 or 20 kg bags.

ARABINOL BIO L

Arabinol Bio L is an instantly soluble, refined and micro-granulated gum Arabic, produced in accordance with organic regulations. Arabinol Bio L is a natural polysaccharide used to increase the softness and the velvety taste of wines. It does not contain SO₂ nor any other preservative. It displays a protective action towards the molecules responsible for the color, which are kept stable during time, facilitating the processes of natural evolution.

- **Dosage:** 10-30 g/hl.
- **Packaging:** product available upon request in 1 or 20 kg bags.
- **Utilization:** must be slowly dissolved in water or wine; the solution should be kept slightly stirred for a better solubilization. No clarification must be carried out after the addition. Being an organic product, the solution must be utilized just after its preparation.
- **Shelf life and storage:** Store in a cool dry place for maximum 2 years.

YEAST POLYSACCHARIDES

ELEVAGE GLU

A yeast derivative with a high percentage of antioxidant tripeptide glutathione. It can be used to improve mid-palate, but this product is especially geared for protecting from oxidation and to reduce the need for SO₂. For best results and to give time to the GSH to dissolve, add Elevage Glu 24 hours before the antioxidant effect is desired.

- **Dosage:** 12-30 g/hl.
- **Packaging:** 500 gram packets and 5Kg bags.

BATONNAGE PLUS ELEVAGE

Made from yeast cells that are rich in peptides, mannoproteins, and antioxidant amino-acids, it increases the positive effect of the sur-lie, making wines more viscous and harmonious. Its utilization at the end of the alcoholic fermentation ensures the prolongation of the antioxidizing action carried out by SO₂. At the same time, the activity of Batonnage Plus Élevage prevents the formation of mercaptans and enhances the bouquet of the varietal. In wines treated with Batonnage Plus Élevage, color appears to be more stable and less subject to browning and pinking.

- **Dosage:** 10-30 g/hl.
- **Packaging:** 5 Kg bags

BATONNAGE PLUS STRUCTURE

An auto lysate yeast blended with “mocha” ellagic tannins. After years of experience, we can claim that this product fixes most aromatic faults in red wines and especially the green notes attributed to methoxypyrazines. It is a yeast preparation combined with highly toasted ellagic tannins that masks the vegetal notes and promotes fruity and chocolate-like aromas.

- **Dosage:** 10-30 g/hl.
- **Packaging:** 5 Kg bags

BATONNAGE PLUS TEXTURE

Polysaccharide based, autolyzed yeast product, rich in mannoproteins. It adds a sweet and viscous texture to red, white, and rosé wines, due to the large size of the molecules that it releases. When added to fermenting musts, it improves the structure and helps with color stabilization in red wines. It also has strong antioxidant properties.

- **Dosage:** 10-40 g/hl.
- **Packaging:** 20 Kg bags

SUPER-MANN

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



- **Dosage:** White wines: 10 – 25 g/hl. Red wines: 10 - 40 g/hl. *TTB allows a maximum of 40 g/hl to be used pre bottling.
- **Packaging:** 1kg bag
- **Utilization:** Re-hydrate in warm water (95°F/35°C) or wine, for 1/2 h before mixing. Then dilute 1:10 in wine and add directly to the tank or barrel. Once homogenized it does not need further stirring. Some particles derived from the yeast cells are not completely soluble, so a good racking or filtration are needed before bottling. Wait at least two weeks before sterile filtration.
- **Shelf life and storage:** store at room temperature and low humidity for two years.

CHAPTER 7

STABILIZERS AND FINING AGENTS

Fining and stabilizing agents are added to a must, juice or wine to modify their composition, increase their resistance to oxidation and microbiological spoilage, improve their sensory characteristics and aesthetic appearance.

Fining agents act to remove an unwanted characteristic or component in already in solution. They include inorganic substances such as bentonite, PVPP, silica and carbon; as well as organic and proteinaceous substances such as gelatin, casein, isinglass and chitosan. Fining agents are implemented for desired effects such as clarification, removal of unwanted odors and colors, reducing the content of heavy metals, eliminating spoilage microorganisms and the components responsible for oxidation.

Stabilizers include potassium metabisulfite, ascorbic acid, citric acid, CMC, and potassium sorbate. They enable the juice, must, or wine to be resistant to adverse change, improve their current state and what they already have in solution, aid in maturity, prevent oxidation and increase their overall longevity.

When using any AEB fining and stabilizing agents, we encourage that trials are performed and evaluated before finalizing any steps to perfect your wine!



MUST PROTECTION

AROMAX B4

Ascorbic and potassium metabisulfite preparation bound to buoyant perlite substrate for dispersion only when wetted by the juice thereby forming a protective layer.

- **Dosage:** 0.5-1 kg per ton (1 kg per ton releases 54 ppm of SO₂ and 60-70 ppm ascorbic acid)
- **Application:** Disperse the powder dry directly to the holding vessel for antioxidant protection
- **Packaging:** 5 kg bag

TARTRATES STABILIZATION

CREMOR STOP EXTRA 40*

Pure metartaric acid with a high esterification index of 38-40%. Add after the addition of inorganic clarifiers, de-acidifying agents and decolorizing and deodorizing carbon. It is recommended that a filtration is carried out 12-24 hours after addition to eliminate 'opalescence'.

- **Dosage:** from 10-15 g/HL.
- **Application:** Dilute the product in cold water at 1:5. Dose into the wine with a Venturi. Do not use on wines high in Calcium or stored in concrete tanks.
- **Packaging:** 1 kg packet

* Not legal for U.S. commercial wineries*

CRYSTALFLASH

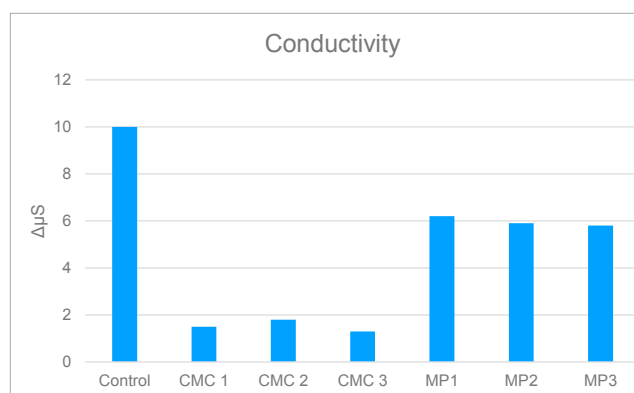
A preparation of potassium bicarbonate, tartaric acid, potassium tartrate and bentonite used to optimize seeding and settling by facilitating the nucleation process

- **Secondary:** Will eliminate oxidation during cold stabilization and shortens time in tank to 3-5 days.
- **Dosage:** from 20-40 ppm.
- **Packaging:** 1 kg packet

NEW-CEL

Carboxymethylcellulose (CMC) acts a colloidal protector that wraps the tartrate crystal structure with a film to deform it and thus prevent tartrate growth.

- **Dosage:** from 100-150 g/hl TTB limit= dosage cannot exceed 0.8% of the wine
- **Application:** Bring wine to 16 Celsius for 8 hours before addition and dissolve directly into the wine 48 hours before filtration or bottling.. Wines must be protein stable and below 1 NTU turbidity. It is recommended to stabilize the color of the wine prior to addition as CMC may interact with unstable color compounds.
- **Packaging:** 1 kg bottle and 25 kg pail



A comparative trial on available techniques to achieve cold stability was performed by AEB, in collaboration with Cal Poly Wine & Viticulture Institute, on a Chardonnay from Santa Lucia Highlands. According to the conductivity tests, the control measured a 10.9% difference in conductivity, 6.9% above the threshold for cold stability. The results for the New-Cel additions showed successful stabilization of all wine samples with the lowest percentage difference of 1.4% and an average of 1.8% difference. The results for the mannoprotein products used as tartrate stabilizers, showed that the wines were not fully cold stable as the lowest percentage difference was 5.8% and an average of 6% difference between all three repetitions made with mannoproteins.

In red wines CMC may interact with unstable color, thus making it precipitates. This unstable color would most likely be lost anyways in a traditional stabilization. However, because of this issue, many believe that CMC cannot be used for stabilizing red wines. An experiment was carried out to achieve tartaric stability of red wines (Veneto region) using New-Cel, trying to avoid color instability.

SAMPLE A (AMARONE DELLA VALPOLICELLA)

- ΔμS 81,0: unstable - Refrigerator: unstable

After dosing 2000 ppm New-Cel:

- ΔμS 44,3 stable - Refrigerator: stable
- Color ΔIC= 0,15 Complete filtration of the wine at room temperature to check the possible presence of precipitate resulted in no precipitate.

SAMPLE B (RIPASSO DELLA VALPOLICELLA)

- ΔμS 80,8 unstable - Refrigerator: unstable

After dosing 2000 ppm New-Cel:

- ΔμS 45,2 stable - Refrigerator: stable
- Color ΔIC= ~ 0,1 - Complete filtration of the wine at room temperature to check the possible presence of precipitate resulted in no precipitate.

SAMPLE C (BARDOLINO)

- ΔμS 92,8 unstable - Refrigerator: unstable

After dosing 2500 ppm New-Cel:

- ΔμS 49,3 stable/at the limit - Refrigerator: stable
- Color ΔIC = 1,1 unstable.

Even if the tartaric stability has been reached, with both methods there is a color precipitation, evident both visually and numerically. Protein stability tests showed that the wine was also protein unstable. The winemaker proceeded with a clarification of the sample with 300 ppm of Bentogran (bentonite) & 10 ml/hL of Gelsol, which stabilized the wine for proteins and phenolics.

Subsequently, the winemaker tried again the addition of 250 g/Hl of New-Cel:

- ΔμS 49,5 stable/at the limit - Refrigerator: stable
- Color ΔIC= -0,1 stable

REDOX ADJUSTMENT

DESULFIN

Liquid copper sulfate preparation used to remove hydrogen sulfide, some mercaptan compounds and reductive odors.

- **Dosage:** from 10ml/HL = 0.25 ppm copper.
- **Application:** Preliminary hydrogen sulfide test should be conducted with 5ml/HL (0.05ml in 1 L of wine). Add Delsulfon directly to the affected wine and recirculate in an open environment. TTB legal limit of copper in finished wine = 1 ppm
- **Packaging:** 1 kg bottle and 5 kg pail

Sulfur compound		Odor	Treatment
H ₂ S		Rotten Eggs	Desulfon
Mercaptans	Methyl Mercaptan	Rotten Cabbage	Desulfon or Taniquer/Taniblanc
	Ethyl Mercaptan	Burnt Match	Desulfon or Taniquer/Taniblanc
Disulfides	DMDS	Cooked cabbage, onion	Ascorbic Acid (5g/HL) + Desulfon or Taniquer/Taniblanc
	DEDS	Burnt rubber, garlic	Ascorbic Acid (5g/HL) + Desulfon or Taniquer/Taniblanc

Sulfur compounds, faults, and recommended treatment.

RIDUXHIGH

Antioxidant stabilizer with 15% ascorbic acid used at bottling to improve shelf life of wines. It lowers redox potential in 24 hours, improves wine aroma and color, and enhances organoleptic properties.

- **Secondary:** Prevents ferric casse to keep iron in soluble form
- **Dosage:** from 100-250 ppm in white and rose wines. From 100-200 ppm in red wines. For every 100 ppm of Riduxhigh sulfur dioxide increases 17 ppm.
- **Application:** Dissolve in 10 parts of wine and add before filtration of bottling.
- **Packaging:** 1 kg packet

PROTECTION FROM WILD YEAST AND BACTERIA

MICROCID

A preparation of potassium sorbate, potassium metabisulfite and citric acid used to prevent re-fermentation of wines containing residual sugar. It inhibits the activity of lactic bacteria that metabolize sorbic acid.

- **Secondary:** Stabilizes sulfur dioxide, prevents oxidation and inhibits volatile acidity
- **Dosage:** from 250-500 ppm.
- **Application:** Dissolve in 10 parts of warm water and add to the filtered and clarified mass. Microacid at 500 ppm increases total sulfur dioxide by 30 ppm and 270 ppm of sorbate.
- **Packaging:** 1 kg packets

STERYL*

A tablet preparation of pure paraffin combined with alyl-isosulphocyanate (a natural mustard oil) with antiseptic properties, especially against aerobic microorganisms-Pichia, Hansenula and Candida. It slowly releases to the atmosphere to sterilize the air above the surface.

- **Dosage:** from 20-40 ppm.
- **Application:** Use one to two tablets and replace every 15 days
- **Packaging:** Steryl Vasche (for tanks) 50 tablets in 1x tablet sachets, Steryl Fusti (for barrels) 80 tablets in 40 x2 tablet sachets, Steryl Demijohns (for small containers) 600 tablets in 50 x 12 tablet sachets

*Not legal for US commercial wineries.

SULFIGRAIN

Potassium metabisulfite at 75% and 25% potassium bi-carbonate preparation in pellet form ideally suited for barrel addition without the loss of sulfur dioxide to the atmosphere.

- **Dosage:** 1 dose contains 5 grams of pure SO₂
- **Packaging:** Box of 25 doses

VOLATILE PHENOLS TREATMENTS: SMOKE AND BRETT CHARACTERS REMOVAL

ANTIBRETT 2.0

A preparation of beta-glucanase enzyme, fungal chitosan and yeast hulls used to inhibit *Brettanomyces* yeast growth. It also is highly effective in absorbing 4-ethylphenol and 4-ethylguaiacol and due to antimicrobial action of both chitosan and beta-glucanase it inhibits the production of vinyl-reductase.

- **Dosage:** from 400-800 ppm.
- **Application:** Dissolve 400-800 ppm in 10 parts of wine or demineralized water and wait two weeks before assessing results. Filter at least 2 weeks after addition before bottling.
- **Packaging:** 500 g can

FREE4FENOL

A preparation composed of a blend of active carbons used to organic compounds such as volatile phenols and phenolic glycosides associated with smoke taint.

- **Secondary:** Specific activation of preparation has very low adsorption of anthocyanidins.
- **Dosage:** from 50-1000 ppm.
- **Application:** Dissolve in must, wine or water at 1:10 and add into pump over.
- **Packaging:** 20 kg bag



CHITOCCEL

A chitosan and yeast hull preparation, a natural polysachharide derived from fungal origin -*Aspergillus niger* used in the elimination of acetic and lactic bacteria, *Brettanomyces* and other yeast.



- **Secondary:** reduces 4-ethylphenol and 4-ethylguaiacol and ochratoxin A and aids in eliminating heavy metal content
- **Dosage:** from 12-18 g/hl.
- **Application:** Dilute the preparation 1:10 in must or wine and leave it in the media for 10 days before racking or filtration.
- **Packaging:** 250 gram package

Discover Chitocel, a product based on natural chitosan.

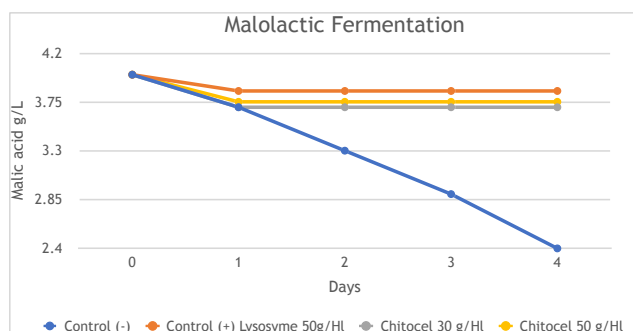
Scan the code to learn more.



LABORATORY TRIAL WITH CHITOCCEL

1. Application to a heavily contaminated wine with *Brettanomyces bruxellensis*:
 - Matrix: wine strongly contaminated with *Brettanomyces bruxellensis* with an evident olfactory imprint.
 - Chitocel dosage: 5 g/hl. Contact time: 10 days. Temperature: 77°F/25°C. Notes: daily shaking.
 - Method of analysis: sterile filtration on a cellulose acetate membrane with 0.2Qm pores. Plates incubation at 86°F/30°C for 3 days on specific medium for *Brettanomyces* counts.
 - Results: Cell count untreated sample = 3×10^3 CFU/l. Cell count treated sample = N/D
2. Application of Chitocel to a wine inoculated with a population of lactic bacteria:

- Matrix: wine heavily contaminated with *Oenococcus oeni* (105 cells/mL).
- Treatments: Chitolcel dosages of 30 g/hl and 50 g/hl. Negative control: no treatment. Positive control: dosage of 50 g/hl of Lysozyme. Contact time: 5 days. Temperature: 77°F/25°C.
- Method of analysis: Malolactic fermentation was measured first by malic acid consumption and second by lactic acid production. The total cell count was made on MRS plates.
- Results: Microbial metabolism is particularly vigorous in the untreated sample, which produced 1.5 g/L of lactic acid. Both Chitolcel treatments showed instead a substantial inhibition toward the conversion of malic acid to lactic acid, with comparable results to those obtained with Lysozyme. Chitosan application is therefore significantly efficient in red wine condition where the interactions between phenolic compounds and lysozyme could occur, thus preventing the risk of color loss that these interactions might engender (Bartowsky et al. 2004).



Chitolcel (300 and 500 ppm) and Lysozyme (500 ppm) effects on Malolactic fermentation (Malic acid).

TRADITIONAL FINING OF MUSTS AND WINES:

BENTOGRAN

Pharmaceutical grade sodium bentonite for protein removal with low impact on wine aromatics. It yields very compact sediment and thus minimizes lees.

- **Dosage:** from 10-60 g/hl.
- **Application:** Before addition rehydrate Bentogran for 20 minutes in 15-20 parts of cold or warm water
- **Packaging:** 1 kg and 25kg bags

CARBOSIL

A preparation of silica and decolorizing carbon used for quick and efficient color removal in must and wine.

- **Dosage:** For color removal: 25-60 ml/hl. When used in combination with gelatin, Carbosil should be added at 5-10x the amount of Gelsol
- **Application:** Used in cold settling along with Gelsol for must clarification or added during fermentation to reduce color. Add diluted 1:1 with water or full strength. For solids and color fining in must add Carbosil before gelatin. In wine wait 30 minutes after gelatin addition then add Carbosil.
- **Packaging:** 25 Kg pail

CATALASI

A combination of bentonite, caseinate, gelatin, ascorbic acid and potassium metabisulfite used to prevent 'pinking' when used during fermentation or cure darkening of white wines, 'brick' hues in rose, and yellow hues in red wines.

- **Secondary:** Restores and highlights original aromas, reduces oxidated polymerized components and acts as an anti-oxidant.
- **Dosage:** from 20-50 g/hl. 10 g/hl of Catalasi yields 5 ppm of SO₂
- **Application:** Dissolve at 1:15 in cold water then add via Venturi.
- **Packaging:** 1 kg pack and 20 Kg bag

CATALASI AF PLUS

A combination of bentonite isinglass, gelatin, PVPP and silica used to remove green and bitter catechins.

- **Secondary:** removal of 'off' flavors derived from reductive phenolics
- **Dosage:** from 20-50 g/hl
- **Application:** Dissolve at 1:15 in cold water then add via Venturi.
- **Packaging:** 1 Kg packet and 20 Kg bag

CATALASI VEGA

A combination of vegetable proteins, PVPP, silica, and activated bentonite effective in cleaning and wine stabilization

- **Secondary:** improves brightness through decreasing turbidity
- **Dosage:** from 50-100 g/hl.
- **Application:** Dissolve at 1:15 in cold water then add via Venturi.
- **Packaging:** 10 Kg net bag



DEACID

A preparation of potassium bicarbonate potassium tartrates salts that decrease the total acidity with neutralization reactions and a quick precipitation of the salts.

- **Secondary:** It will aid in eliminating green and aggressive characters in the wine by contributing to the freshness and body.
- **Dosage:** from 130 g/hl.
- **Application:** Add directly to the must or wine when pumping over gradually to avoid temporary localized deacidification
- **Packaging:** 5 and 25 kg bag

DECORAN GRAN

An activated decolorizing carbon in mini pellets used to remove excess color and reduce the content of polyphenols and catechin.



- **Dosage:** from 5-100 g/hl.
- **Application:** Dissolve in must, wine or water at 1:10 and pump over. When desired absorption of color is complete, proceed with filtration or clarification.
- **Packaging:** 15 Kg bag

GELSOL

Liquid gelatin produced through irreversible hydrolyzation to ensure stability. It has a high clarifying effect through instant formation of macro-coagula with compact sediment.

- **Secondary:** Helps wine to be less susceptible to oxidation and will not diminish color intensity.
- **Dosage:** Trials with Gelsol are recommended with density of 1.2 g/ml and starting at 5-60 ml/hl of Gelsol in wine. In must clarification in combination with Spindasol, do trials starting at 6-60 ml/hl and compact with 5-10x the weight of Spindasol or Carbosil.
- **Application:** Dilute the preparation until 10 times its volume in demineralized water. The addition is carried out in the juice with a dosing pump placed at the exit of the press or on the pre-concentrated juice in the tank.
- **Packaging:** 25 kg, 250 Kg drum and 1,200 Kg tote

MICROCEL

A preparation of potassium caseinate, active cellulose fibers, and micronized pharmaceutical bentonite that facilitates the removal of proanthocyanidins and monomeric catechin responsible for oxidation.

- **Secondary:** Musts treated with Microcel produce more complex wines and increase retention of varietal characteristics.
- **Dosage:** from 20-50 g/hl.
- **Application:** Dissolve in 5-10 parts of cold water, wait 15 and add mass quickly with turbulence.
- **Packaging:** 10 and 25 Kg bag

MICROCEL AF

Is an allergen free version of Microcel where the potassium caseinate is replaced by pure PVPP.

- **Dosage:** from 20-50 g/hl.
- **Application:** Dissolve in 5-10 parts of cold water, wait 15 and add mass quickly with turbulence.
- **Packaging:** 25 Kg bag
- **Spindasol W:** Liquid Silica for extra compaction of settling agents or carbon fining.
- **Secondary:** When used in must lees are heavier than when using bentonite alone.
- **Dosage:** Add Spindasol in 5-10 the amount of protein based clarifier to be used. As a general settling agent 50-100 ml/hl.
- **Application:** Mix Spindasol using a Venturi or by pumping over either diluted 1:1 with water or full strength. In must add Spindasol before adding Gelsol. In finished wines add Gelsol and wait 30 minutes, then add Spindasol to settle.
- **Packaging:** 10 Kg and 25Kg drum

QUICKGEL AF

Allergenic free gelatin in combination with bentonite used for fast removal of high turbidity and polysaccharides

- **Secondary:** forms a compact net of flocculants yielding brightness and easier filtration.
- **Dosage:** from 30-90 g/hl.
- **Application:** Dissolve in 10 parts cold water and let rehydrate for 20-30 minutes. Add slurry to the tank and pump over. Wait 48 hours before racking and filtration. dosing pump placed at the exit of the press or on the pre-concentrated juice in the tank.
- **Packaging:** 500 gram and 10 Kg packets

VE-GEL

Gelatin based on vegetable proteins which has a high reactivity towards bentonite and silica to obtain quick clarification with compact deposits.

- **Secondary:** can be used during floatation, alone or in association with bentonite.
- **Dosage:** from 10-50 g/hl.
- **Application:** Dissolve Ve-gel 1:15 in water and add it with venturi.
- **Packaging:** 1 Kg and 20 Kg bags



CHAPTER 8

FILTRATION

FINAL MEMBRANES: ABSOLUTE PES PLUS



In 2021 Danmil has developed a new model of final cartridges with Polyethersulfone membranes called Absolute PES Plus, that is stronger than the previous Danmil Absolute PES, with a more flexible cage and an improved absorbing area surface that for the 30" is equal to 2.4 m² or 25.8 ft²



Absolute PES	Absolute PES Plus
Porosity 0,22Q-0,8Q-1,2Q	Porosity 0,45Q-0,65Q
Standard inner core	Stronger inner core (higher temperatures)
4 layers	3 layers
112 foldings	145 foldings
Folding height 10,6 mm	Folding height 10,9 mm
0,68 m ² for 10" module	0,8 m ² for 10" module
New sealer used for welding	New sealer used for welding

Absolute PES Plus cartridges integrity test

Ask our agents for the parameters to input on your integrity tester or use the following procedure for a manual integrity test:

- Procedure for the manual integrity test:

Wash the line for 3-5 minutes opening and closing the exit valve. This step needs to insure the cartridge membrane is well wet. Reach 1/1.5 pressure. Close water inlet in the housing and purge out most of the excess water, opening the Nitrogen valve next to the manometer.

Close the outlet valve in the housing and generate a pressure (1.5 bars for 0.45 and 1 bar for 0.65) using the nitrogen valve next to the manometer.

Open the outlet valve and check for pressure fall. If the pressure holds for 5 minutes the cartridge is ok. If the pressure falls it means that there are pores bigger than 0.45 or 0.65 (depending on what membrane was tested) and the filtration is no longer absolute.

Integrity test video tutorial

Scan the code to learn more.



Regeneration of final PES membranes with Membran UF (effective for organic soluble contaminants).

- Rinse in the direction of filtration with pre-filtered cold water with a flow rate 1.5 times higher than the normal filtration flow rate at > 5 psi (0.34 bar) for 5-10 minutes to eliminate any coarse organic residues. This step is fundamental as it reduces the risk of “cooking” proteins (for example, -glucans) that occurs when washing and rinsing directly with boiling water.
- Rinse in the direction of filtration with pre-filtered water at 125-180 °F (50-80 °C) at 5-30 psi (0.34-2.0 bar) for 15-20 minutes. The warmer the water, the better the results will be, but do not exceed 180 °F (80 °C).
- Caustic wash (cocurrent): dilute Membran UF (AEB caustic detergent) at 1 - 5% solution with water at 125 -140 °F. Dilution will vary depending on water hardness, soil load, temperatures, etc. Recirculate for 15 minutes before returning to hot caustic tank or dispose.
- Hot water rinse (cocurrent) at 75 °C - 165 °F is then circulated for 15 minutes allowing for all the caustic to flow to drain. A conductivity probe is normally inserted within the circuit to ensure that all the caustic has been removed.
- Cold water, filtered to less than 2 microns absolute and exposed to ultraviolet irradiation, is used as a final rinse (cocurrent).
- Systems are often left filled with a proprietary sterilant like X-wash until the next production is scheduled. This is then flushed through using clean cold water until all traces of sterilant are removed.
- Danmil cartridges can be sanitized using Peracid (Peracetic solution) at 1% for 30 minutes at 95-120°F or 35-50°C

Temperature (°C)	Delta pressure (bar)
20	5
45	3.2
60	2.8
70	2.2
82	1.8

POLYPROPYLENE PRE-FILTER CARTRIDGES:

AEB-Danmil also manufactures polypropylene cartridges to be positioned before the more expensive membranes for protection. They're nominal and come in different porosities

Regeneration of pre-filters (Polypropylene) in both directions (cocurrent and countercurrent).

When P on the pre-filter reaches 0.5-0,8 bar, it is advisable to proceed with a chemical regeneration utilizing Membrane UF at 1-2% in warm water at 40-50°C and flush the pre filter for 10 minutes. Before regenerating is good practice to first wash with cold and warm water 50-60°C as described before. When done regenerating, rinse thoroughly with cold water.



FILTER PADS

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

DANMIL 110 / 130 Sterilizing filtration with reduction of microorganisms	
CHARACTERISTICS	APPLICATIONS
High rate of microbiological retention, possible thanks to the narrow-pored structure of the filter media, combined with an electrokinetic potential with adsorption action (charged).	-In sterile cold bottling, in order to improve the shelf life of wines, beer and juices.
	-As pre-filters upstream of membrane filtration, thanks to the high retention capacity of colloidal components.
DANMIL 50 / 70 Filtration with reduction of microorganisms and microfiltration	
CHARACTERISTICS	APPLICATIONS
They allow to reach high levels of clarification for their effective retention capacity of the finest particles and microorganisms.	Storage and bottling of microbiologically stable wines.
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CHARACTERISTICS	APPLICATIONS
They allow to reach high levels of clarification for their effective retention capacity of the finest particles and microorganisms.	Storage and bottling of microbiologically stable wines.

DANMIL DEPTH FILTRATION RANGE

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

- Pads components

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.

- 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 steaming

Wash

50 liters/m² at 1.5 x the filtration flow rate

- 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.



Danmil Carbon: filter pads for color and flavor adjustments

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 alleviate 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). They have many 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 of carbon pads:

- 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



CHAPTER 9

SPARKLING WINES

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

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

- Tartaric acid and pH (see evolution of pH in fig. 1)
- Ca⁺⁺ and K⁺ cations, where these cations increase exponentially when getting in the 3rd press fraction and the hard press

- Turbidity, with a linear increase proportional to the pressure applied
- Polyphenols extraction (see TPI evolution in fig. 1)
- Oxidation of the juice, which becomes critical sometime in the second press fraction, at the breaking point of the berry

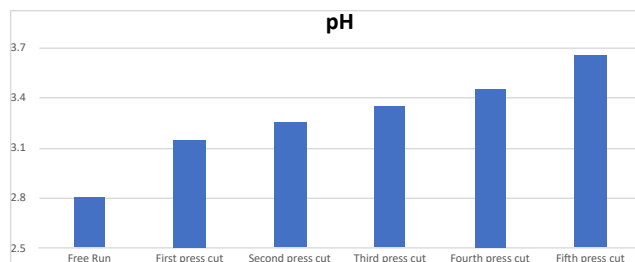


4,000 kg of grapes (8,800 lbs)		Champagne	Good	Optimal	
Free-run		150 l	300 l	300 l	
Press fraction 1	Start	Cuvée: 2,050 l	Cuvée A: 1,600 l	First Cuvée: 400 l	
	End			Cuvée core: 600 l	
Press fraction 2	Start			First Cuvée: 200 l	
	End			Cuvée core: 400 l	
Press fraction 3	Start		Cuvée B: 400 l	First Cuvée: 50 l	
	End			Cuvée B: 350 l	
Press fraction 4	Start		Hard press: 350 l	Hard press: 250 l	Hard press: 250 l
	End				

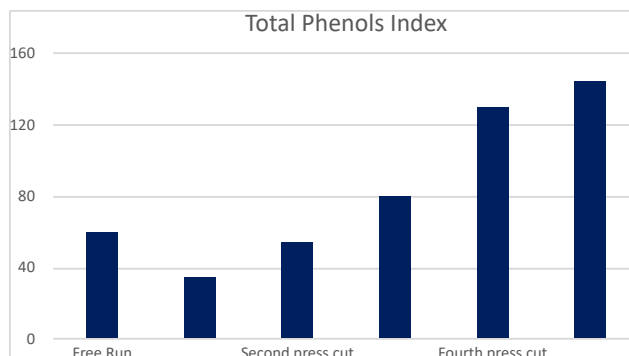
example on press cuts management for sparkling wines

Press Cut	Reserve	Millésime	Extra Brut	Brut	Reserve wine
Cuvée Core	100%	85%	60%		50%
First Cuvée			15%	50%	50%
Cuvée B		15%	25%	20%	
Hard press				25%	
Free run				5%	

Sparkling blends could be assembled by playing with the different qualities of juice coming out of the press.



Evolution of pH



Evolution of phenolics

MUST FINING

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

When it comes to clarifying the must, winemakers have substantially two choices:

Static Clarification:

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

Flotation with systems like **E-Flot**

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



Fig. 3: E-flot 80

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



Acidity management:

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

1. Tartaric acid: is the specific acid, it's a "structuring acid", the spine of the wine. Tartaric acid has an important influence on taste perception and wine stability, during winemaking its concentration will only decrease. It's recommended to achieve tartaric stability in base wines, but we can further stabilize during the dosage with **Arabinol HC** and **New-Cel** (gum Arabic and Carboxymethylcellulose).
2. Malic acid: the specific acid of maturation, with its concentration decreasing during ripening. It is largely responsible for the sensation of freshness in the end of the mouth, or bitterness and greenness if its concentration is poorly controlled. Winemakers making sparkling need to know as early as possible if the wine will go through malolactic fermentation or not. If malolactic is not preferred for sensory reasons, excessive Malic acid could be taken out with a *non-saccharomyces* (*Schizosaccharomyces*) like AEB's **Promalic**, which is capable of metabolizing Malic acid into alcohol.

3. Lactic acid: its concentration depends on the microbiological strains of transformation of grapes into wine (yeast and bacteria). It's a weak acid that has a significant taste influence in terms of "fat". It is responsible for the feeling of freshness in the middle of the mouth but can be responsible of exaggerated "creaminess" and "heaviness" in case of excess.

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

pH

To start with a low pH is crucial to make a good sparkling wine. A low pH will keep a clean and fresh palate and protect from the challenges of evolution including guaranteeing color stability, redox balance, a higher molecular SO₂ which, for example, is 6% active at pH 3,0 but just 3.9% active at pH 3.2.

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

Also, low pH's increase the positive charge of proteins making those more unstable because of their strong affinity for the negatively charged phenolics. Fermenting on bentonite like **Bentogran** or fining agents from the **Microcel** and **Catalasi** lines of products will reduce the need of protein stabilization down the line.

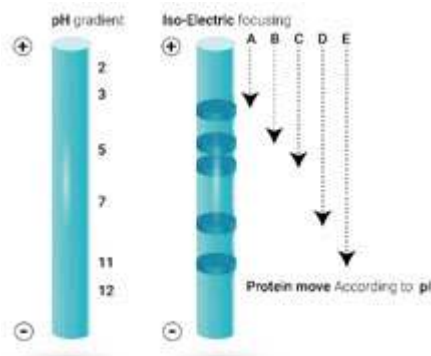


Fig. 4: the lower the pH the stronger attraction for negative molecules (higher protein instability)

pH REDUCTION AND TARTARIC STABILITY WITH CATION EXCHANGE: STABYMATIC

To reduce cations like K⁺ and Ca⁺⁺ and stabilize for tartrates while at the same time reducing the pH, AEB has developed a system, suitable for musts, that can be utilized by both small and large wineries: Stabymatic is a line of ion exchange equipment that includes manual, semi-automatic or fully automated units. With its utilization winemakers normally can lower the pH by .3 points.

The principle of the machine is that the wine loses its potassium and, to a lesser extent, calcium in exchange for protons. The result of this exchange is tartaric stability and lower pH.

Fig.5: Stabymatic line, manual, semi-automatic, fully automated



PHENOLIC PROFILE MANAGEMENT

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



Timing:

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

Tannins addition, along with micro-oxygenation with **Microsafe** can also help the polymerization of bitter catechins and promote a smoother polyphenolic profile.

If that is not possible and bitterness is a concern, the must needs to be fined with proteins-based products or PVPP as shown in the table.

keeping in mind that is always better to treat the juice rather than the wine, with the utilization of enological products we can treat, or better prevent eventual faults in the different press fractions.

	Free Run	First Press	Second Press	Third Press
Preferred Clarification	Flotation	Cold settling	Flotation/cold settling	Flotation
Proteins	Bentogran	Bentogran	Microcel or Catalasi line	Microcel or Catalasi line
Microorganism	Primaflora 50 ppm	Primaflora 30 ppm	Primaflora 40 ppm	Primaflora 50 ppm
Polyphénols fining	Catalasi Vega 300 ppm	Microcel AF 200 ppm	Catalasi Plus AF 300 ppm	Quickgel AF 100 ppm
Pesticides and color	Decoran Gran		Decoran Gran	Decoran Gran
Pectines	Endozym Ice			

Must fining recommendations

RIDDING (REMUAGE)

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



PRISE DE MOUSSE

The ideal base wine:

- Alcohol shouldn't be higher than 11.5% (it will get to 13 during the prise de mousse)
- pH should be higher of 2.9 (free SO₂ will be too active at lower pH's)
- Base wine should be de-gassed.

- Set temperature between 14 and 17 C (classic method) or up to 20 (pressurized tank), the higher the temperature the higher the biomass.
- The base wine needs to stable for tartrates and proteins
- The ideal base wine has a good complexity of aromatic and for this purpose we recommend nutrition of the yeast on aminoacids with products like **Fermoplus Floral, Tropical, Sauvignon or Fermoplus Prosecco**

The ideal starter:

Preparing the yeast for the tirage is a crucial process because the cells needs to adapt to difficult conditions (low pH, alcohol, SO₂, etc.).

We recommend **Fermoplus Energy Glu**, a nutrient rich in amino acids specific to boost the biomass as a nutrient to build a strong pied de cuve with our range of yeast for this purpose:

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

Levulia Probios: organic certified strong Bayanus

Fermol Charmat: strong Bayanus

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

FASTER TIRAGE: THE REACTIVATEUR

Traditionally a good starter is made over the course of three days.

Successful trials demonstrated that with AEB Reactivateur winemakers can rehydrate and inoculate into the tank in one day (<8h), instead of 3-4 days procedures.



In a trail run in a California winery increase of pressure inside the tank (0.5-0.8 bar), signaling strong start of fermentation was monitored in less than 24 h compared to 48-72 h, and target pressure of 5 bar was reached in 7 days instead of 18-21. No aromatic defects and other significant changes in the chemistry of the wine were detected and filtration was successful, using crossflow equipment prior to bottling.



Fig.: Reactivateur

DOSAGE

Denomination	Sugar Level
Brut	Under 12 g/l
Demi-Sec	Up to 32 g/l
Extra Brut	< 5 g/l

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

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

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

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

Technologies for fine tuning

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 polishing filtration.

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

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

Fibroxcel VAC: vacuum filters tend to have an extremely compact layer of earths that eventually breaks or plugs, Fibroxcel VAC mixed at 10% with the DE used for the filtration guarantees a smooth cut of the top layer and, thanks to its softening action, delays plugging of the cake and prevents cracks. The drum cut is linear and micrometric, with a noticeable increase in the total filtration capacity, with the result of a more satisfactory yield.

The addition of Fibroxcel Vac makes it possible to treat very quickly suspensions loaded with hazy matter, which would require a great work to discharge coats, with the assurance of an excellent result. Fibroxcel Vac can also be used in conjunction with the body feed in pressure filters for particularly hazy musts and concentrates.

Graph from filtration folder: Darcey

Darcey values for AEB filtering earths

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

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

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

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

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

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

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

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

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



Photo: Fibroxcel pallets at winery in Italy

CHAPTER 10

HELPFUL HINTS

YEAST REHYDRATION AND ACCLIMATION

1. Using clean and sanitized equipment, prepare 10 liters of warm water per kilogram of yeast (1.2 gallons of water per pound). The ideal temperature is 38°C (100°F) for *Saccharomyces cerevisiae* and *bayanus* strains.
2. While stirring, slowly add 250 grams of the rehydration nutrient Fermoplus Energy GLU per kilogram of yeast (1:4). Be sure that all clumps are broken up and well-mixed. Slowly mix-in the yeast, again making sure to break up all clumps. Do not mix using a drill or any aggressive mixing technique that might cause shearing of the yeast cells. Make sure that the mixture gets plenty of oxygenation. This, along with the nitrogen supplied by the Fermoplus Energy Glu, will build a bigger and stronger yeast biomass.
3. After 20-30 minutes the yeast is fully rehydrated and will now need a sugar source to stay viable.
4. Portions of must are gradually added to the yeast mixture in small increments while gently stirring. Normally an equal amount of must is slowly mixed into the yeast mixture over a span of time of 5 minutes. While adding the must, monitor the temperature and make sure it does not drop more than 5°C/10°F at any time during this must addition.
5. After 15 minutes, slowly add an equal amount of must to the mixture, again making sure the temperature does not drop more than 5°C/10°F.
6. Repeat this step every 15 minutes until the yeast mixture is within 5°C/10°F of the tank temperature. Add the inoculum to the must in the tank and ensure that the tank is properly vented to release pressure.



SEQUENTIAL INOCULATION PROTOCOL

1. Rehydrate *Levulia Torula* or *Levulia Alcomeno* in lukewarm water (80°F/25°C) for 20 minutes with Fermoplus Energy Glu.
 2. Inoculate the selected non-*Saccharomyces* yeast at 250 ppm at a wine temperature of 62°F/16°C.
 3. 24-72 hours after, or at 1/3 fermentation, rehydrate the selected Fermol yeast at 100 °F/38°C with Fermoplus Energy Glu.
 4. Inoculate 250 ppm of Fermol yeast and add 120-240 ppm of Fermoplus Integrateur
 5. Adjust temperature of fermentation.
- Max SO₂ concentration in juice 30 ppm.

YEAST NUTRIENTS ADDITION PROTOCOL

1. Add 0.5 lb/1000 gal Fermoplus Energy Glu 3.0 in rehydration to ensure fast yeast adaptation and to increase fermentation performance.
2. Add 100-200 ppm of organic nitrogen nutrients (Dap Free, Tropical, Floral) right after inoculation.
3. Calculate the total YAN requirement, depending on the yeast strain, juice chemical analysis, and fermentation parameters: YAN addition will be equal to the target YAN minus the available YAN.
 - Very low/ low YAN requiring strains = Brix x 7.5
 - Medium YAN requiring strains = Brix x 9
 - High YAN requiring strains = Brix x 12.5
4. Fermentations prolonged using low temperatures (<12 C) will need about 20% extra YAN.
5. Target your YAN with DAP containing nutrients at 1/3 of the fermentation (e.g. 100-200 ppm Fermoplus Integrateur or Enovit P).
6. If the fermentation is sluggish or stuck, consider adding 100-200 ppm Fermocel P or Celloferm.

HOW TO RE-START A STUCK OR SLUGGISH FERMENTATION

1. Rack the wine off the gross lees into a sanitized tank.
2. While racking, add 180 ppm of Celloferm to the receiving tank. Celloferm will help purify the compromised must from toxins and contaminants.
3. In a tub, bring 250 mL water for every hL of stuck wine to treat (2.5 gal water/1000 gallons wine) to 40°C (104°F).
4. Add 60 ppm of Fermoplus Energy Glu rehydration nutrient.
5. Add to this mixture 250 ppm of Fermol Complete Killer Fru yeast according to the total volume of the stuck wine.
6. Mix the yeast and nutrient thoroughly with a paddle.
7. Let the yeast rehydrate for 20 minutes.
8. Check the temperature of the yeast mixture before moving on to step 9.
9. Take out of the problematic tank 250 mL of stuck must per hL of its total volume.
10. Add this to the yeast mixture, making sure that during the addition the temperature does not change more than 5°C/10°F.
11. Add 250 ppm grams of light white grape concentrate to the yeast slurry depending on the total volume of the stuck wine.
12. Take a sample of this starter and measure the RS, if possible.
13. Cover and hold for 12 hours in a warm part of the cellar. Maintenance of the temperature at around 21°C (70°F) is recommended.
14. Check the RS. Make sure that there are signs of active fermentation before moving to the next step (a RS drop will confirm yeast activity).
15. Transfer yesterday's start-up from the tub into the small wine tank.
16. Slowly add 750 mL of stuck wine per hL of total volume of stuck wine and 150 ppm of light grape

concentrate to the small tank. Adjust according to the total volume of the stuck wine. Stir well.

17. Record the RS and hold over night. Make sure the small wine tank is vented.
18. Check once more that the mixture is actively fermenting before moving on.
19. Add 10 more liters of stuck wine for each hL of total wine to the small tank and mix well. Hold for another night.
20. Transfer the small tank to the stuck wine tank and mix well. If possible, maintain the tank temperature between 21-24°C (70 - 76°F). Monitor RS regularly.

HOW TO PERFORM A PECTIN TEST

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

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

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

E-Flot Sizes Processing speed per hour Electricity needed

E-Flot 5: 1,320 gallons, 220V Three Phase
 E-Flot 25: 6,600 gallons, 480V Three Phase
 E-Flot 50: 13,200 gallons, 480V Three Phase
 E-Flot 80: 21,133 gallons, 480V Three Phase
 E-Flot 130: 34,300 gallons, 480V Three Phase

HOW TO PREPARE A SOLUTION FOR A BENCH TRIAL

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

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

1. Prepare stock solution: weight 1.2 grams of product, either liquid or powdered (what counts is still the weight, so pipette liquid products on the weight dish right on the precision scale). Add some wine to rinse off the weight dish into the flask and bring solution to 100 ml with the same wine to be treated.
2. If using a fining product, use water instead of wine.
3. Add stock solution to desired wine to achieve the dosage rate that you are looking for. Every 1 ml of stock solution added to 100 ml of wine will be equal to an addition of 12 g/hL (120 ppm or 1 lb/1000 gal).

PRODUCT DENSITY

Product diluted 10 times	1lb 1,000 gallons	10 grams/Hl	Density of pure product at 20 °C
Arabinol	1.1 ml in 1 liter	0.91 ml in 1 liter	1.1 +/- 0.05
Arabinol Arome	1.1 ml in 1 liter	0.91 ml in 1 liter	1.1 +/- 0.05
Arabinol HC	1.0 ml in 1 liter	0.87 ml in 1 liter	1.15 +/- 0.05
Arabinol Super Rouge	1.1 ml in 1 liter	0.91 ml in 1 liter	1.1 +/- 0.05
Carbosil	1.0 ml in 1 liter	0.83 ml in 1 liter	1.2 +/- 0.05
Gelsol	1.0 ml in 1 liter	0.83 ml in 1 liter	1.2 +/- 0.05
Liquid Tannins	1.0 ml in 1 liter	0.83 ml in 1 liter	1.2 +/- 0.05
Spindasol	1.0 ml in 1 liter	0.83 ml in 1 liter	1.2 +/- 0.05

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

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

MALOLACTIC FERMENTATION

HOW TO INCREASE BUTTERY (DIACETYL) FLAVOR

- According to our research, additions of 1000 ppm of Citric acid in partially aerobic conditions can double the amount of diacetyl in the final wine.
- The bulk of the conversion will start after the Malic acid is all depleted and will be diminished by the presence of SO₂. If diacetyl is desired, it is better to wait a few days after completions of MLF before SO₂ addition.
- Diacetyl is adsorbed by the lees. The practice of leaving wine on the lees diminishes Diacetyl concentration, both because the lees will adsorb it and because the cells of bacteria that are still viable will convert Diacetyl into acetoin. Adding products like AEB Super-mann, Elevage Glu, or Bâtonnage Elevage, can give the same impact of a good sur lies, without the risk of losing diacetyl.
- If diacetyl is desired, do not co-inoculate ML with yeast.
- A faster ML produces less diacetyl. For higher Diacetyl, play with the temperature and pH to ensure that the Malo-Lactic fermentation lasts about 2 weeks.



HOW TO BOOST ML BACTERIA BY PROPAGATION

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

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

HOW TO AVOID PINKING

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

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

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

1. Maintain the reductive state of grapes: at arrival use 100-600 ppm or 100 kg of grapes of Gallovin.
2. Optimization of clarification: During clarification add 1500-100 ppm of Catalasi AF Plus.
3. Maintain the reductive state of wine during storage:
 - Elevage Glu 20 g/hl
 - Gallovin 5-20 g/hl

HOW TO AMELIORATE SMOKE TAIN T DURING WINEMAKING

Over the past two decades, wildfires have increasingly exposed vineyards and grapes to smoke in different parts of the world. Smoke taint (undesirable sensory characters, such as smoky, burnt, ashy, or medicinal) is caused by volatile phenolic compounds, which can be present in the must in their free form or bundled together to form glycosides. During fermentation (and over time in barrel or bottle), these glycosides can break apart, releasing the volatile phenols into the must or wine. This increases the perception of smoky flavor. Several techniques and products can be employed in the winery to minimize the sensory impact of undesirable smoke-derived aromas, flavors, and compounds in wine.

1. Minimize contact with the skins.
 - Hand pick fruit, exclude leaf material, maintain integrity of harvested fruit, keep fruit cool (50 °F/10°C), whole bunch press and separate press fractions, minimize fermentation time on skins.
2. Increase wine complexity using aromatic yeast.
 - Fermol Arome Plus, Fermol Red Fruit, Fermol PB2023
 - Increase yeast aromas productions: Fermoplus DAP FREE, Fermoplus Tropical, Fermoplus Floral. 200-400 ppm at the beginning of fermentation
3. Consider addition of tannins to balance the shortened skin contact.
 - Tanéthyl Effe to stabilize the color from the beginning.
 - Protan Peel to add skin tannins.
 - Ellagitan Fruit Reserve to reduce intensity of smoke characteristics through increased wine complexity.
4. Conduct trials with fining agents.
 - Free4fenol
 - Antibrett 2.0

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



INDEX

A		D		Endozym ICS 10 Éclair	30
Antibrett	55	Deacid	57	Endozym ICS 10 Rouge	32
Arabinol	47	Decoran Gran	57	Endozym Micro	30
Arabinol Arome	47	Desulfin	54	Endozym Muscat	29
Arabinol Bio D	48	E		Endozym Rouge deep skin	32
Arabinol Bio L	48	EB Berry Mix	42	Endozym Rouge light skin	32
Arabinol HC	47	EB Fruit Reserve	42	Endozym β -Split	31
Arabinol Super Rouge	47	EB Goud-Ron	42	Endozym Thiol	31
Aromax B4	52	EB XO	42	Endozym TMO	33
Auxilia	20	Elevage Glu	49	Enovit P	20
B		Ellagitan Barrique Liquid	42	F	
Batonnage Plus Elevage	49	Ellagitan Barrique Blanc	41	Fermentation Tannins	36
Batonnage Plus Structure	49	Ellagitan Barrique Rouge	41	Fermocel P	21
Batonnage Plus Texture	49	Ellagitan Extreme	39	Fermol Arome Plus	10
Bentogran	56	Ellagitan Refill	39	Fermol Blanc	11
C		Ellagitan Rouge	39	Fermol Chardonnay	11
Carbosil	56	Endozym Active	29	Fermol Charmat	70
Catalasi	56	Endozym Antibotrytis	33	Fermol Complete Killer Fru	13
Catalasi AF Plus	57	Endozym Cat-O	30	Fermol Elegance	13
Catalasi Vega	57	Endozym Contact Pelliculaire	32	Fermol Fleur	11
Celloferm	21	Endozym Cultivar	30	Fermol Lime	11
Chitocel	55	Endozym Flotation	29	Fermol Mediterranee	12
Cremor stop extra	52	Endozym Glucapec	31	Fermol PB 2033	13
Crystalflash	52	Endozym Ice	30	Fermol Premier Cru	12

Fermol Red Fruit	12	FREE4FENOL	55	P	
Fermol Rouge	12	G		Primaflora VB	14
Fermol Sauvignon	10	Gallovin	36	Primaflora VR Protan Biopeel	14
Fermol Super 16	13	Gallovin Liquid	37	Protan AC	40
Fermol Tropical	11	Gelsol	57	Protan Malbec	40
Fermoplus Blanc Varietal	20	Glutaferm One	13	Protan Peel	40
Fermoplus DAP Free	19	H		Protan Pepin Oxilink	40
Fermoplus Energy Glu 3.0	18	HELPFUL HINTS	73	Protan Q Bio	40
Fermoplus Floral	19	I		Protan Raisin	41
Fermoplus Integrateur	20	Levulia Alcomeno	13	Q	
Fermoplus Malolactique	25	Levulia Cristal	70	Quickgel AF	58
Fermoplus Premier Cru	20	Levulia Torula	14	R	
Fermoplus Prosecco	19	Lysocid	33	RIDUXHIGH	54
Fermoplus Pyr-Off	19	M		S	
Fermoplus Sauvignon	19	Malolact Acclimatée	24	STERYL	54
Fermoplus Tropical	19	Malolact Acclimatée 4R	24	SULFIGRAIN	54
Fermotan	36	Malolact Rapid	24	SUPER-Mann	49
Fermotan AG	38	Microcel	58	T	
Fermotan Blanc	37	Microcel AF	58	Tanethyl EFFE	37
Fermotan CB	38	Microcid	54	Tanethyl	41
Fermotan Liquid	36	N		Taniblanc	39
Fermotan SG	38	New-Cel	53	Taniquerc	39
Filtering sheets	62	O		V	
Filtration	60	Organic Winemaking	7	Ve Gel	58



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