Welcome to the 2020 edition of the Scott Labs’ Winemaking Handbook! This publication, now in its 25th year, has a new name but the same purpose—to bring the wine industry the best fermentation and enological products while delivering the best product application support and winemaking know-how.

I recently came back to Scott Labs (for the 3rd time!) after having been away for several years. Since my return I have been amazed by the people who serve the needs of our fermentation and enology customers. Our team is large, geographically diverse, knowledgeable, friendly, and fiercely dedicated to getting things right. We are available to answer your questions, help you troubleshoot a problem, track down an order, or just lend a sympathetic ear. I’m proud to be part of this team and wanted you to meet us if you haven’t done so already.

You have a friend at Scott Labs. Your success is our success and we love being part of your community.

WELCOME: YOU HAVE A FRIEND AT SCOTT LABS

SUPPLIERS

LALLEMAND

www.lallemandwine.com

These products have changed the way North America makes wine and have changed winemakers’ understanding of winemaking.

Lallemand is the leader in knowledge, education, applications and product development for winemakers worldwide. With 150 research scientists, 11 research labs, over 70 publications, eight patents, and collaboration with educational institutions on five continents, Lallemand is committed to the ongoing success of the global wine industry. Their solutions to winemaking problems are both cutting-edge and practical.

The origins of the Institut Oenologique de Champagne (IOC) headquarters in Epernay, France can be traced back to the founding of the Entrepôt Général de la Champagne in 1890. Since 2010, Scott Laboratories has supplied their products to North America.

ANCHOR

www ancor-oenology.com

In the early days, the IOC was known for post-fermentation products. Today they offer not only fining agents and stabilizers, but yeast and other wine processing products for still and sparkling wines.

THE OAK LAB

www theoaklab.com

The Oak Lab is a portfolio of oak infusion products that was launched in 2019 and is the newest division of Scott Laboratories. The Oak Lab’s mission is to deliver oak infusion products that are unique and exceedingly high-quality.

The Oak Lab’s flagship Thermic line of products are produced using a revolutionary process. The Thermic products are consistent in their flavor and aroma profiles and reliably scale up from bench trials to production volumes with remarkable fidelity.

OENOBRANDS

www oenobrands.com

Oenobrands comes to the Scott Laboratories portfolio with a distinguished pedigree. Supported by its world renowned parent companies, DSM Food Specialties and Anchor Oenology, Oenobrands provides wine-makers with innovative and scientifically sound solutions. This results in revolutionary products from brands such as DSM, Rapideal and Claritar.

ERBSLÖH

www erbsoeh.com

Scott Laboratories is proud to add Erbslöh to our list of suppliers. Erbslöh is one of the most trusted names in the industry. Based in Geisenheim, Germany, this family owned company brings the Scott Laboratories portfolio premium bentonites and granulated carbons.

BIOSEUTICA

www bioseutica.com

Bioseutica produces our lysozyme. The Bioseutica Group’s experience with egg-derived proteins extends back to the 1940s and they are now the world’s largest producer of these products. In the early 1990s Bioseutica introduced its BacTec technology.

AIRD INNOVATIONS IN CHEMISTRY

www airdchemistry.com

AIRD® Innovations in Chemistry specializes in environmentally conscious cleaning products for the wine industry. Founded over two decades ago in New South Wales, Australia, AIRD grew up near the vineyards with the goal of providing sustainable, non-hazardous alternatives to caustic for cleaning stainless steel and other surfaces.
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Please Note:
The information in this booklet is, to the best of our knowledge, true and accurate. The data and information, however, are not to be considered as a guarantee, expressed or im- plied, or as a condition of sale of our products. Furthermore, it is understood by both buyer and vendor that wine is a natural product. Circumstances such as fruit qualities and cellar conditions are infinitely variable. It is the responsibility of the buyer to adapt the use of our products to such circumstances. There is no subsitute for good winemaking practices or ongoing vigilance.

Vendor Notice:
The information in this booklet is, to the best of our knowledge, true and accurate. The data and information, however, are not to be considered as a guarantee, expressed or implied, or as a condition of sale of our products. Furthermore, it is understood by both buyer and vendor that wine is a natural product. Circumstances such as fruit qualities and cellar conditions are infinitely variable. It is the responsibility of the buyer to adapt the use of our products to such circumstances. There is no subsitute for good winemaking practices or ongoing vigilance.
Let’s Start

SAUVY™
Dare to mark your territory
Unleash the full potential of your Sauvignon blanc

Sauvy is a wine yeast perfect for Sauvignon blanc and other aromatically intense white wines. Sauvy was selected for its exceptional ability to reveal volatile thiols, most notably 4MMP, leading to the contribution from yeast-derived polysaccharides.

Find Sauvy on page 30.

LAKTIA™
Give back freshness to your wines

Laktia is a natural alternative for acidification. Laktia is a pure culture of Lachancea thermotolerans used to produce high levels of lactic acid during fermentation. Laktia gives winemakers new possibilities to naturally acidify wine during fermentation.

Find Laktia on page 35.

GLUTA STAR™
Get Supreme High Power
THE KING OF NATURAL ANTIOXIDANTS

Glutastar is a yeast derivative nutrient that protects and stabilizes wine aroma and color due to its unique content of antioxidant peptides and high concentration of GSH (reduced glutathione). Glutastar’s high antioxidant and scavenging of free radicals leads to increased wine shelf life. Glutastar also increases the perception of freshness and mouthfeel thanks to the contribution from yeast-derived polysaccharides.

Find Glutastar on page 51.

EXOTICS NOVELLO
ICONIC, FRESH AND FRUITY WINES

Exotics Novello is a new all-purpose yeast strain that enhances aromatic expression in white and red wines. This strain is an inter-species hybrid between Saccharomyces cerevisiae and Saccharomyces cariocanus.

Find Exotics Novello on page 23.

SOLO SELECT
SECURITY AND STRUCTURE

Anchor Solo Select is a malolactic bacteria selected for its ability to perform MLF under a wide range of conditions. This robust culture can enhance complexity and structure as well as dark fruit and spicy characteristics.

Find Solo Select on page 59.

GranuBent PORE-TEC

GranuBent PORE-TEC is a new-to-us sodium-based bentonite for the removal of heat unstable proteins. Like all Erbslöh bentonites, GranuBent PORE-TEC is highly purified. Its production using PORE-TEC technology makes it virtually dust free and easy-to-use. GranuBent PORE-TEC joins our other specialty bentonites—BlancoBent UF, compatible with cross-flow filtration, and FermoBent PORTE-TEC, used during fermentation—from the Erbslöh family of products. Find GranuBent on page 97.

BALANCE & STRUCTURE

Minimize herbaceousness while amplifying fruit aromatics with feelwood! BALANCE & STRUCTURE fermentation oak chips. These oak chips are a mix of untoasted, light, and medium toasted French oak.
Find out more on page 75.

SWEET & FRESH

Enhance fruit, add mid-palate sweetness, while increasing length and finish with feelwood! SWEET & FRESH fermentation oak chips. These oak chips are untoasted 100% French oak.
Find out more on page 75.
Modern winegrowers face many challenges including increasing climatic uncertainty, demands from consumers looking for less chemical inputs in the vineyard, and high expectations of grape quality while maintaining crop yields. Innovative vineyard strategies are needed to help growers meet these and future challenges.

**VINEYARD PRODUCTS**

Lallemand has developed several innovative products for use in the vineyard. The LalVigne® products, derived from inactivated yeast, offer winegrowers novel tools to promote sustainable viticulture while maintaining and protecting grape quality and yields. LalVigne is the outcome of Lallemand’s deep knowledge of microbial technology and rigorous research with respected viticultural institutions.

**LALVIGNE® IS A VINEYARD TOOL TO IMPROVE WINE QUALITY**

- Advances phenolic maturity
- Increases uniformity in ripening
- Reduces herbaceous and green flavors (pyrazines)
- Protects volatile aromas and enhances mouthfeel

**SELECTING LALVIGNE FOR SUCCESS**

Each vineyard will differ in its potential to provide quality grapes and yield depending on many factors. In order to successfully choose and apply the best LalVigne product it’s important to understand the vineyard location, the stage of growth of the vines, the vintage conditions, and the grape variety.

**VINEYARD LOCATION**

In cooler climates phenolic maturity can be difficult to reach. Due to the onset of rain and early frosts the harvest date may be determined by external factors and not by grape maturity. In warm climates optimal sugar levels are often reached before phenolic maturity. Application of LalVigne minimizes the sugar/maturity gap and allows winemakers the opportunity to make picking decisions based on flavor.

**VINE GROWTH PHASE**

LalVigne is applied at the beginning of veraison. Maximum benefit of a LalVigne treatment is when the first spray is applied at 5% veraison and the second application is 10–12 days later. If the window of veraison is missed, there is still some benefit in applying LalVigne (see chart on Page 5).

**VINTAGE CONDITIONS**

Drought, rainfall, temperature and light variations are dominant conditions affecting the vintage. These variations impact vine growth rates, vigor, yield and fruit composition. Berry size, tannins, flavor, color, aroma and Brix are all uniquely affected by each vintage conditions.

**GRAPE VARIETY**

LalVigne can reduce green and herbaceous flavor when applied to grape varieties high in pyrazines (Cabernet Sauvignon, Cabernet Franc, and Merlot). When using LalVigne on white grape varieties there is an increase in compounds that help stabilize volatile aromas. With highly aromatic varieties such as Sauvignon blanc, Muscat, and Riesling LalVigne can increase varietal aromas.

**HOW DOES LALVIGNE WORK?**

LalVigne is an inactivated yeast product that is sprayed as a foliar spray on the grapevines twice during early veraison. The plant receptors in the leaves recognize the yeast as a possible pathogen, which activates the plant’s secondary metabolism. The production of secondary metabolites includes anthocyanins, tannins and other phenolic compounds, resulting in uniform ripening and better quality of grapes and the resulting wine.

LalVigne Aroma® and LalVigne Mature® are registered in the following states: AL, AK, AZ, CT, DE, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NY, NC, OR, RI, TN, TX, UT, VA, WI, WY

LalVigne LA and LalVigne LM are registered in the following states: CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NY, NC, OR, RI, TN, TX, UT, VA, WI

The following states have registered use: ID, ND, OK, SD, WY

<table>
<thead>
<tr>
<th>Application Recommendation</th>
<th>Recommended Dosage</th>
<th>Timing of Second Application</th>
<th>% Veraison at First Application</th>
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<tr>
<td>1 treatment = 2 applications</td>
<td>1 application = 2.7 lb/acre/1.2 kg/acre</td>
<td>LalVigne Mature® 100% veraison</td>
<td>5% (ideal) 12-14 days after first application</td>
</tr>
<tr>
<td>5—30%</td>
<td>7 days after the first application</td>
<td>LalVigne Aroma®</td>
<td>5% (ideal) 12-14 days after first application</td>
</tr>
<tr>
<td>30-50%</td>
<td>7 days after the first application</td>
<td></td>
<td>5% (ideal) 12-14 days after first application</td>
</tr>
<tr>
<td>50–70%</td>
<td>7 days after the first application if 100% veraison is not reached</td>
<td></td>
<td>5% (ideal) 12-14 days after first application</td>
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<td>70%</td>
<td>Not recommended</td>
<td></td>
<td>5% (ideal) 12-14 days after first application</td>
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**LALVIGNE® AROMA + LALVIGNE LA**

Yeast-based foliar spray for enhancing varietal expression

- White grape varieties

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Dosage</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>#17500</td>
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<td>$110.00</td>
</tr>
<tr>
<td>#17501</td>
<td>3 kg</td>
<td>$110.00</td>
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</table>

**LALVIGNE® MATURE + LALVIGNE LM**

Yeast-based foliar spray for phenolic maturity and uniform ripening

- Red grape varieties

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<tr>
<th>Product Code</th>
<th>Dosage</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>#17510</td>
<td>1 kg</td>
<td>$94.00</td>
</tr>
<tr>
<td>#17511</td>
<td>1 kg</td>
<td>$94.00</td>
</tr>
</tbody>
</table>

Recommended Dosage

1 treatment = 0.9 lb/acre/405 g per acre

LaVigne Aroma® and LalVigne Mature® are registered in the following states:

CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NY, NC, OR, RI, TN, TX, UT, VA, WI, WY

LaVigne LA and LalVigne LM are registered in the following states:

CA, CO, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NY, NC, OR, RI, TN, TX, UT, VA, WI

The following states have registered use:

ID, ND, OK, SD, WY
YEAST

Since our founding in 1933 as the Berkeley Yeast Laboratory, yeast has been at the heart of our portfolio. Our first commercial yeast strains were provided on slants and came from the yeast collection housed at the University of California, Berkeley during prohibition. Growing yeast from slants poses microbial challenges for winemakers so we started providing yeast in an active dried form. For many years we produced and dried our strains at a large brewery, but in 1973 we partnered with Lallemand who began to produce our wine strains in addition to their baking strains. This partnership launched Lallemand into wine yeast production. Lallemand continues to isolate and bring new wine yeast strains to winemakers worldwide and they remain the most respected wine yeast producer in the world.

Today’s wine yeast strains are well characterized and improvements have been made in their strength, purity and reliability. A near century of wine yeast cultivation makes Scott Laboratories and our yeast partners uniquely positioned to assist winemakers with yeast to meet the demands of today’s winemaking.

SELECTING YEAST FOR SUCCESS

Harvested grape lots can differ from vintage to vintage and from block to block even within the same vineyard. There is no such thing as “standard” fruit chemistry and you can improve your yeast selection success by knowing the fermentable sugar, yeast assimilable nitrogen (YAN), and physical condition for every lot of fruit. Knowing the pH, irritable acidity (TA), malic acid and potassium concentration for each lot is also helpful for your entire winemaking plan.

As a reminder:

- **FERMENTABLE SUGAR**
  - Yeast strains vary in their ability to tolerate ethanol levels. The initial sugar content will help determine the final ethanol content. Initial sugar content may be determined by gravity (usually reported as °Brix) or by direct measurements of sugar.

- **YAN**
  - Yeast strains vary in their need for yeast assimilable nitrogen (YAN). Our strains are classified as low, medium or high nitrogen-demanding strains. The amount of nitrogen a yeast will need is dependent upon its individual needs, the initial sugar level and the temperature of the fermentation.

- **TEMPERATURE**
  - Yeast strains vary in their temperature tolerance. Do not stress the yeast by fermenting at the upper or lower end of the recommended range. Temperature management is a key factor of yeast health, fermentation rate and security. Temperature should be measured directly under the cap in red must/wine and the results are impressive.

- **FRUIT CONDITION**
  - Yeast strain choice can be optimized for unsound or spoiled fruit. Yeast strains that have a short lag phase, are low volatile acidity (VA) producers, and are positive/neutral for competitive factors, will be quick to out-compete microbial spoilers, won’t contribute to VA, and won’t be sensitive to microbial attack. If the fruit was treated with high SO2 to combat spoilage, consider using a no to low H2S-producing strain.

### Why should you add 25 g/L* of yeast?

<table>
<thead>
<tr>
<th>Lower potential for osmotic shock</th>
<th>Shorter lag phase</th>
<th>Faster onset of fermentation</th>
<th>Shorter fermentation length</th>
<th>Lower final VA</th>
<th>Lower final residual sugar</th>
<th>Healthier cell population</th>
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<tbody>
<tr>
<td><strong>Yeast without YSEO</strong></td>
<td>0.24</td>
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<tr>
<td><strong>Yeast with YSEO</strong></td>
<td>0.18</td>
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* If sugar is greater than 25 °Brix you should increase your inoculation rate to at least 20 g/L. (25 lb/1000 gal) Increasing dosage of yeast may help prevent a sluggish or stuck fermentation.

### HOW TO MAKE GOOD YEAST BETTER

**QTL PROCESS: BREEDING YEAST THAT DO NOT PRODUCE SULFIDES OR SULFUR DIOXIDE**

Selective breeding is used to improve the traits of enological strains of Saccharomyces cerevisiae. At the genetic level, traits may be controlled by a single/small group of genes or by a large group of genes.

Yeast strains that are controlled by a single or small group of genes have been the traditional target of selective breeding. When two yeast strains, each with different traits controlled by one or a few genes, are bred together, daughter yeast are easily screened to find the correct combination of traits.

Some yeast traits are genetically complex and traditional selective breeding and screening methods are an ineffective tool to target these traits. For example, if we bred two strains of wine yeast, one that produces low levels of H2S and another that produces low levels of SO2, it is very difficult to identify the daughter yeast that is both a low H2S and low SO2 producer.

This is because these traits are controlled and influenced by a large group of genes.

Quantitative Trait Loci (QTL) is a new technique that allows us to pinpoint the location of all genes involved in complex yeast functions. Now when we selectively breed yeast we can quickly screen daughter strains for the desired trait. Combining QTL mapping with selective breeding has allowed Lallemand to produce a line of no to very low H2S, SO2, and acetaldehyde producing strains. This is a non-GMO technique and all QTL process strains are naturally bred. Look for the QTL logo in yeast descriptions.

**YSEO PROCESS: YEAST PREPARATION IMPROVES PERFORMANCE AND SENSORY QUALITY**

Did you know that the way in which a yeast is produced can have a major impact on wine quality? In the early 2000s, Lallemand began developing a new yeast preparation technique. The Yeast Selective Optimization (YSEO) optimizes yeast nutrient additions during cell growth and the results are impressive.

The chart shows that yeast produced using the YSEO process produce less volatile acidity (VA) in a variety of wine types. In each fermentation the same yeast strain was used in identical conditions. The only difference was that one group of wines was treated with yeast produced using the YSEO process and the other with the traditional yeast production process.

**YSEO IS A UNIQUE AND INNOVATIVE PROCESS FOR YEAST DEVELOPED BY LALLEMAND.**

The benefits of the YSEO process are:

- Reduced lag phase
- Better adaption to stressful conditions
- Optimized fermentation
- Reduced potential for VA

Adapted from the article, “Evaluation of the YSEO Process to Prepare Dried Winemaking Yeast by Silhjile Krieger1, Anne Ortiz-Julien1, Françoise Ragnié1, Ann Dumont1, Forbes Wardrop1, Charles G. Edwards2

1 Lallemand, 1620, rue Prefontaine, Montreal, QC Canada
2 Department of Food Science and Human Nutrition, Washington State University, Pullman, WA, U.S.A.
## YEAST STRAINS FOR WHITE & ROSÉ WINE

<table>
<thead>
<tr>
<th>Yeast Strain Type</th>
<th>Highly Recommended</th>
<th>Recommended</th>
<th>N. Hawaiien</th>
<th>O. Terminata</th>
<th>M. Rhodoshcan</th>
<th>S. bayanus</th>
<th>Yeast Hybrid/Other</th>
<th>Yeast Blend</th>
<th>Alcohol Tolerance</th>
<th>Relative Nitrogen</th>
<th>Temp. Range (°F)</th>
<th>Fermentation Speed</th>
<th>Competitive Factor</th>
<th>Sensory Effect</th>
<th>MLF Compatibility</th>
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### Important Notes

1. The alcohol tolerance column indicates performance possibilities in good circumstances and conditions. Alcohol tolerance may vary as circumstances and conditions vary.

2. Relative nitrogen needs refer to how much nitrogen one strain requires relative to the other strains on this chart. See article on page 45.

3. The temperature column indicates general performance possibilities. It is not a substitute for sound winemaking. Yeast may be stressed or die if temperatures are sustained at extremes of their tolerance. Keep in mind that a yeast's ability to ferment within the given range also depends on alcohol and other antagonistic conditions.

Red Wine Yeast Strains continue on next page
### YEAST STRAINS FOR RED WINE

<table>
<thead>
<tr>
<th>Yeast Strain Type</th>
<th>Highly Recommended</th>
<th>Recommended</th>
<th>NC</th>
<th>M</th>
<th>Alcohol Tolerance</th>
<th>Relaxed Nitrogen</th>
<th>Temp. Range (°F)</th>
<th>Fermentation Speed</th>
<th>Competitive Factor</th>
<th>Sensory Effect</th>
<th>MLF Compatibility</th>
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<td>16%</td>
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</table>

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2. Relative nitrogen needs refer to how much nitrogen one strain requires relative to the other strains on this chart. See article on page 45.

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**Important Notes**

This chart is only useful as a quick reference guide. For more information on selected yeast strains, please refer to the yeast section of this handbook.
## Yeast Strains for American & Hybrid White Cultivars

| Yeast Strain Type | Highly Recommended | Recommended | M  Mouthfeel | EVC  Enhanced Varietal Character | Mod Moderate | Ntrl Neutral | Snstv Sensitive | Avg  Average | Yeast blend | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer | Yeast hybrid/buffer |
|-------------------|-------------------|-------------|---------------|----------------|-------------------------------|--------------|--------------|----------------|--------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| S. cerevisiae cerevisiae | S. cerevisiae bayanus | Yeast hybrid/buffer | Yeast blend | Alcohol Tolerance | 14% | 14% | 15.5% | 15% | 15% | 15% | 15.5% | 14% | 14% | 14% | 17% | 15.5% |
| Temp. Range (°F) | 54-77 | 59-85 | 57-82 | 59-77 | 57-87 | 56-61 | 59-86 | 59-90 | 57-80 | 54-80 | 59-80 | 59-90 | 56-61 | 55-80 |
| Competitive Factor | Nor | Sadt | Yes | Yes | Sadt | Sadt | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sensory Effect | EVC | Esters | EVC | Esters | EVC | Esters | EVC | EVC | EVC | Esters | EVC | Esters | EVC |
| MLF Compatibility | Average | Very Good | Good | Good | Average | Very Good | Good | Average | Very Good | Good | Average | Very Good | Good |
| Reduces maleic acid content | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Amorella | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Blanc du Bois | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Chardonnay | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Frontenac blanc | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Frontenac gris | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Riesca | • | • | • | • | • | • | • | • | • | • | • | • | • |
| La Crescent | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Muscadelle | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Rosé | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Seyval blanc | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Tannat | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Vidal blanc | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Vignoles | • | • | • | • | • | • | • | • | • | • | • | • | • |

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## Yeast Strains for American & Hybrid Red Cultivars

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<tr>
<th>Yeast Strain Type</th>
<th>Highly Recommended</th>
<th>Recommended</th>
<th>M  Mouthfeel</th>
<th>EVC  Enhanced Varietal Character</th>
<th>Mod Moderate</th>
<th>Ntrl Neutral</th>
<th>Snstv Sensitive</th>
<th>Avg  Average</th>
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</table>

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3. The temperature column indicates general performance possibilities. It is not a substitute for sound winemaking. Yeast may be stressed or die if temperatures are sustained at extremes of their tolerance. Keep in mind that a yeast’s ability to ferment within the given range also depends on alcohol and other antagonistic conditions.

## Hybrid and Non-Vinifera Wines

Most native American grape cultivars tend to have strong fruit flavors and aromas as compared to European cultivars. This is especially true of rotundifolia (Muscadine) and labrusca varieties. The combination of strong fruit and high acid is often balanced by creating wines with residual sugar. French-American hybrid varieties are crosses between Vitis vinifera and one or more American varieties. As a result of the breeding it is possible to create cultivars that have aromas and flavors that are more or less reminiscent of their European ancestors. In addition to viticultural practices, wine style can be influenced by the yeast strain. Yeast can enhance flavors and aromas, mouthfeel and varietal expression. If the yeast can convert flavorless thiol precursors into aromatic elements or produce enzymes that cleave glycosidic bonds and release aromatic terpenoids into the wine, then varietal characteristics are enhanced. Yeast can also produce high levels of polysaccharides which can increase mouthfeel, balance harshness and acidity (within reason) and add to the colloidal stability of the wine.

In the last few years, new strains of yeast have shown promise with hybrids and native American varieties. These strains are listed in the chart above.

**HYBRID AND NON-VINIFERA WINES (CONTINUED)**
**YEAST STRAIN DESCRIPTIONS**

### 43 RESTART

**Preacclimated fructophilic yeast for restarting stuck fermentations**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>MEDIUM</td>
<td>54-77°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

43 RESTART™ is the result of an innovative pre-acclimation process developed by Lallemand using Uvaferm 43, a strain isolated by Lallemand in collaboration with the research center of Inter-Rhône in France.

43 RESTART’s resistance to stressful conditions of stuck fermentations has been naturally enhanced. Acclimation includes addition of micronutrients, steroids and polyunsaturated fatty acids to strengthen 43 RESTART cell membranes. Yeast cells are more robust, acclimate quicker and have a lower mortality rate after inoculation.

43 RESTART is sensory neutral and malolactic bacteria compatible. For best results use the 43 RESTART protocol for stuck wines. See page 36 for protocol which includes Reskue™ and Fermaid Q™ and best practices.

### 58W3

**Spicy and fruity aromatic white wines**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>MEDIUM</td>
<td>59-85°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

58W3™ contributes an overall well-balanced mouthfeel with spicy, floral and fruity aromas. Allows for the release of bound terpenes in aromatic varietals due to the strain’s beta-glucosidase activity. This enhances classic varietal characters.

Due to 58W3’s fermentation kinetics, especially in high sugar juices, a balanced nutrient strategy and good fermentation practices should be followed.

This strain was isolated during a five-year study by the INRA (National Agricultural Research Institute) in Alsace, France.

### 3001

**Suitable for wines that have undergone cold soak**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>MEDIUM</td>
<td>54-90°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

Vitivelure 3001™ is recommended for use with cold soak protocols to produce intense Pinot noir wines with aging potential. Wines made with 3001 are noted for fruit and varietal characters that are both elegant and complex.

This strain was isolated, studied and selected from the prestigious Côte de Nuits terroir in Burgundy during a three-year research project by Laboratory Burgundia Oenologie in Beaune, France. The goal of this selection program was to find a dominant yeast strain from a traditional cold soak that would enhance the varietal character, intensity, and balance of Pinot noir.

Tolerant of standard SO2 additions and low temperatures for a steady and reliable alcoholic fermentation following cold soak.

### 71B

**Softens high acid musts**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>MEDIUM</td>
<td>55-95°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

71B™ is known for fermenting fruity rose wines and semi-sweet whites. It sythesizes relatively stable esters and higher alcohols resulting in long-lived aromas. Respects rosé wine color.

Softens high acid musts by partially metabolizing malic acid. Sensitive to competitive factors and may have difficulty competing with wild microflora. Careful rehydration with GermProtect Evolution™ and early inoculation will help 71B dominate in competitive conditions.

This strain was isolated and selected by the INRA (National Agricultural Research Institute) in Narbonne, France.

### 3001I

**Blend of yeast strains for fruity and floral esters**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>MEDIUM</td>
<td>56-61°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

Alchemy I is a blend of Saccharomyces cerevisiae wine yeast strains developed in collaboration with the AWRI in South Australia.

Alchemy I is a very high producer of 2-phenylethanol (rose), 2-phenylethyl acetate (floral and fruity), 8-ionone (raspberry) and acetate esters (fruity and candy).

It produces complex wines with good structure and body and is suitable for all red varietals.

### 3001II

**Blend of yeast strains for expressing volatile thiols**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.5%</td>
<td>MEDIUM</td>
<td>56-61°F</td>
</tr>
</tbody>
</table>

**Saccharomyces cerevisiae**

Alchemy II is a blend of Saccharomyces cerevisiae wine yeast strains developed in collaboration with the AWRI in South Australia for optimal aromatic profile.

Alchemy II enhances volatile thiols such as boxwood, passion fruit, grapefruit, kiwifruit and guava aromas. It is highly recommended for cool tank fermentations of Sauvignon blanc (New Zealand, South African or Chilean style).

Under difficult conditions (pH=3.2, turbidity under 80 NTU, low YAN, temperatures below 15°C(59°F), Alchemy II can be stressed and will produce VA.

Alchemy II is a low SO2 producer with fast fermentation kinetics. Temperature management is crucial.

### 3001III

**Blend of yeast strains for complex structured reds**

<table>
<thead>
<tr>
<th>Alcohol Tolerance</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>56-61°F</td>
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</tbody>
</table>

**Saccharomyces cerevisiae**

Alchemy III is a blend of Saccharomyces cerevisiae wine yeast strains developed in collaboration with the AWRI in South Australia.

Alchemy III is a very high producer of 2-phenylethanol (rose), 2-phenylethyl acetate (floral and fruity), 8-ionone (raspberry) and acetate esters (fruity and candy).

It produces complex wines with good structure and body and is suitable for all red varietals.

Alchemy III is a strong fermenter, producing minimal SO2 and high levels of glycerol (8-11 g/L).
Alchemy IV is a strong fermenter, produces minimal SO2, and wines with heightened aroma intensity. Flavors and elevate terpenes while producing smooth, round wines with heightened aroma intensity. Alchemy IV is a strong fermenter, produces minimal SO2, and high levels of glycerol (8–11 g/L).

**BA11** Strong fermenter for white wine mouthfeel  
Reisling, Vignior, Sauvignon blanc, Pinot blanc, Gewürztraminer, Riesling, Muscat, Rhone Whites, Aromatic Whites  
#15117  500 g  $46.00

Latvin BA11™ promotes clean aromatic characteristics and intensifies mouthfeel and persistent flavors in white or sparkling base wines. BA11 can enhance fresh aromas of tropical fruit, cream, vanilla and spice in relatively neutral white grape varieties. This S. cerevisiae cerevisiae strain was selected in 1997 near the Estação VitiVinicola de Barraida in Portugal.

**BM 4X4** Mouthfeel and color stability for extended fermentations  
Sangiovese, Cabernet Sauvignon, Grenache, Zinfandel, Chardonnay, Structured Reds  
#15176  500 g  $55.00

Latvin BM 404™ is a blend of Latvin BM42™ (see scottlab.com for more information) and another yeast known for fermentation reliability. The BM4X4 blend was formulated to provide the aromatic complexity of BM45 while providing greater reliability under difficult fermentation conditions. In Italian red varieties sensory descriptors include jam, floral and cherry liqueurs, sweet spice, licorice, cedar and earthy elements. Produces high levels of polyphenol-reactive polysaccharides, resulting in wines with increased mouthfeel and improved color stability in reds. In whites, BM 4X4 releases high levels of esters responsible for fruit aromas. Poor malolactic fermentation compatibility.

**ASSMANSHAUSEN (AMH)** Allows for the expression of indigenous microflora  
Pinot noir, Zinfandel, Reisling, Petit Sirah, Gewürztraminer  
#15632  500 g  $49.00

Enoferm AMH™ has a long lag phase with a slow to medium fermentation rate. A well-managed nutrient program during rehydration and fermentation is essential. Enhances spicy (clove, nutmeg) and fruit flavors and aromas while adding overall complexity. Fermentation potential is enhanced with AMH if the culture is allowed to develop in about 10% of the total must volume for eight hours prior to final inoculation. AMH is a Saccharomyces ludriacceri strain originating from the Geisenheim Research Institute in Germany.

**Uvaferm BDX™** Steady fermenter for Bordeaux varietals  
Merlot, Cabernet Sauvignon, Zinfandel, Petit Verdot, Structured Reds  
#15634  500 g  $49.00

Uvaferm BDX™ is a reliable fermenter for high quality red wines and allows for the expression of varietal character. This strain does not generate a lot of heat during fermentation. Optimizes color and structure with soft tannin extraction and increased mouthfeel. Selected from the Institut Pasteur strain collection in Paris, France.

**Uvaferm BRL97™** Classic strain for Burgundy varietals  
Chardonnay, Pinot noir  
#15670  10 kg  $685.00

Lalvin BRL97™ respects varietal characteristics and helps retain color in grapes sensitive to color loss. Past starter and a moderate speed fermenter. Demonstrates good malolactic fermentation compatibility and high alcohol tolerance. This strain was isolated at the University of Turin in Italy from a Nebbiolo fermentation. To enhance complexity, BRL97 fermented wine may be blended with wines fermented with RC212™ or W15™. To enhance complexity, BRL97 fermented wine may be blended with wines fermented with RC212™ or W15™.

**CEG (EPERNAY II)** Sweet and semi-sweet wine production  
White, Rosé  
#15081  500 g  $25.00

Uvaferm® CEG was isolated by the Geisenheim Research Institute in Germany. Notable for its ability to deliver slow, steady and clean fermentations. Optimal fermentation temperatures range from 15–25°C (59–77°F). CEG fermentations often slow or stop under stressed conditions leaving residual sugar. This makes CEG advantageous for use in semi-dry white or rosé wines.

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#15081  500 g  $25.00

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**Lalvin BM 404™** A fast fermenter. Ability to produce significant amounts of polysaccharides during fermentation leading to enhanced mouthfeel and body. This strain was isolated in Burgundy at the IUVV (Institut Universitaire de la Vigne et du Vin) laboratory in Dijon, France.
**CLOS**

Ultra-premium reds

- Syrah, Grenache, Tempranillo, Zinfandel, Petite Sirah, Barbera, Petit Verdot. Structured Reds. Molise

| #15201 | 500 g | $46.00
| #15204 | 10 kg | $560.00

Lalvin CLOS™ was selected for its ability to enhance aromatic complexity, structure and mouthfeel. Notable for its high alcohol tolerance (up to 17% v/v) and good implantation in difficult conditions. Good compatibility with malolactic bacteria. This strain was isolated by the University of Rovira i Virgili in Spain from the Priorat region.

Alcohol Tolerance: 17%

Nitrogen Needs: MEDIUM

Temp. Range: 57-90°F

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**CSM**

Minimizes herbaceous characters in under-ripe fruit

- Cabernet Sauvignon, Cabernet Franc, Merlot, Petit Verdot.

| #15638 | 500 g | $49.00
| #15639 | 10 kg | $592.00

Wines fermented with Enoferm CSM™ have shown intense aromas of berries, spice and licorice. CSM has been known to reduce vegetal aromas and add complexity with a balanced, round mouthfeel. CSM is malolactic friendly and was selected by the Institut Français de la Vigne et du Vin (IFV, formerly ITV) in Bordeaux in cooperation with Conseil Interprofessionnel du Vin de Bordeaux (CIVB-Bordeaux).

Alcohol Tolerance: 14%

Nitrogen Needs: MEDIUM

Temp. Range: 59–90°F

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**CROSS EVOLUTION**

Natural yeast hybrid to enhance aromatics and mouthfeel

- Chardonnay, Gewürztraminer, Pinot gris, Riesling, Sauvignon blanc, Rosé, Rhône Whites, Muscat, Albariño, Aromatic Whites

| #15640 | 500 g | $49.00
| #15641 | 10 kg | $592.00

Cross Evolution™ is a strong fermenter and ideal for aromatic white and rosé wines that have a high alcohol potential. This strain complements an increased mouthfeel style resulting in aromatic wines that are balanced.

Increases fresh fruit and floral aromas in whites and rosés. This hybrid yeast is from a unique breeding program at the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa.

Alcohol Tolerance: 15%

Nitrogen Needs: LOW

Temp. Range: 58-68°F

---

**CVRP**

High polysaccharide producer for roundness in reds

- Cabernet Franc, Cabernet Sauvignon, Merlot, Petite Sirah, Tempranillo

| #15207 | 500 g | $46.00
| #15208 | 10 kg | $560.00

Ideal for big reds, CVRP™ is one of the highest polysaccharide producers in the Lallemand yeast collection. CVRP enhances mouthfeel, roundness, soft tannins and elevated varietal character. Good compatibility with malolactic bacteria.

Alcohol Tolerance: 16%

Nitrogen Needs: MEDIUM

Temp. Range: 64-90°F

---

**CWVS**

Production of stable esters in whites

- Chardonnay, Chenin blanc, Pinot gris, Rosé, Sparkling Base, Albariño, Muscat, Aromatic Whites, Fruit Wine

| #15237 | 500 g | $46.00
| #15240 | 10 kg | $560.00

CWVS™ is a high producer of fruity aromas (esters) and low producer of volatile acidity and SO2. CWVS has the lowest nitrogen demand of the Lallemand yeast strains. Strong fermenter even under difficult conditions, including low turbidity. This S. cerevisiae bayanus strain was selected from the Lallemand yeast collection and is a daughter strain of Lalvin EC1118™ (see pg 22).

Alcohol Tolerance: 15%

Nitrogen Needs: LOW

Temp. Range: 57-82°F

---

**CY3079 (BOURGOBLANC)**

Classic strain for barrel-fermented whites

- Chardonnay, Pinot blanc

| #15082 | 10 kg | $560.00

Lalvin CY3079 (Bourgoblanc)™ is highly recommended for barrel-fermented and sour aged Chardonnay. Autolyses quickly at the end of fermentation resulting in wines with roundness. Enhances aromas of fresh butter, almond, honey, flowers and pineapple. CY3079 is a steady, average fermenter even at cooler temperatures (15°C/59°F). This strain demonstrates good alcohol tolerance and low production of volatile acidity and H2S when nutrient requirements are met.

This strain was isolated for its ability to complement typical white Burgundy whites by the Bureau Interprofessionnel des Vins de Bourgogne (BIVB) in France.

Alcohol Tolerance: 15%

Nitrogen Needs: HIGH

Temp. Range: 59-77°F

---

**EC1118 (PRISE DE MOUSSE)**

Original sparkling wine strain

- Sparkling Base Wines

| #15103 | 500 g | $29.00
| #15076 | 10 kg | $143.00

Lalvin EC1118™ is the original, steady, low-foamer yeast strain. This Saccharomyces cerevisiae bayanus strain was selected by the IOC in Epernay, France and is the reference strain for sparkling base wine. It is an excellent choice for secondary fermentations of sparkling wine. Ferments well at low temperatures and finishes with compact lees. Under low nutrient conditions EC1118 can produce high amounts of SO2 (up to 50 ppm) and, as a result, may inhibit malolactic fermentation.

Alcohol Tolerance: 18%

Nitrogen Needs: LOW

Temp. Range: 50-86°F

---

**ELIXIR**

Vitilevure Elixir™ expresses terpenes, thiols, and floral and fruity aromas (from fatty-acid esters), adding complexity to aromatic varieties.

Good implantation in clarified juice. Strain requires good nutrition and proper temperature control. It is a low SO2, H2S and volatile acidity producer.

Elixir is a hybrid yeast cross resulting from the yeast hybridization program at the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa.

Alcohol Tolerance: 15%

Nitrogen Needs: MEDIUM

Temp. Range: 57-77°F

---
Exotics Mosaic is a hybrid of yeast strains coming out of the Exotics line from Anchor. I find that Exotics Mosaic enhances varietal character without the inherent risk of spontaneous fermentation. I love that it can be used successfully in both reds and whites.

Exotics Novello combines the novel sensory profile of Saccharomyces cariocanus and S. paradoxus developed at the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa.

Storage: 5-15°C(41-59°F)

Alcohol Tolerance: 15.5%
Nitrogen Needs: MEDIUM
Temp. Range: 64–83°F

NEW

**EXOTICS NOVELLO**

All purpose hybrid yeast for aromatic expression and mouthfeel

Made with Sauvignon blanc, Viognier, Aromatic Whites, Merlot, Chardonnay, Syrah, Sangiovese, Grenache, Tempranillo.

Alcohol Tolerance: 15.5%
Nitrogen Needs: MEDIUM
Temp. Range: 62-82°F

Developed by Anchor Oenology in collaboration with the Australian Wine Research Institute (AWRI), Exotics Novello is a Saccharomyces hybrid having the sensory characteristics of S. cariocanus and the fermentation security of S. cerevisiae. Exotics Novello has some pectinase activity. Known for being a steady fermenter but sensitive to cold temperatures. Can produce elevated levels of glycerol (9-13 g/L) which potentially leads to lower alcohol. Low volatile acidity and SO₂ production. Strain can partially degrade malic acid and is known to facilitate and enhance malolactic fermentation.

Exotics Mosaic is a hybrid of Saccharomyces cerevisiae and S. paradoxus developed at the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa.

Storage: 5-15°C(41-59°F)

Alcohol Tolerance: 15.5%
Nitrogen Needs: MEDIUM
Temp. Range: 64–83°F

**STAFF PICK**

"The yeast strains that I most often recommend is Exotics Mosaic. I fell in love with it while using it on hybrid grapes 10 years ago. It has the magical ability to both add body and reduce acidity which helps soften the mouthfeel in high-acid varietals. This strain is cold-sensitive which is a benefit when someone is looking to ar-rest fermentation to balance the wine with some residual sugar. I love that it can be used successfully in both reds and whites. I find that Exotics Mosaic enhances varietal character without being over-the-top and mimics the aromatic complexity that is desired from spontaneous fermentations without the inherent risk of spontaneous fermentations. I’m really excited to start working with this yeast strains coming out of the Exotics line from Anchor."

—Katie Cook, Sales Representative based in Upstate New York

**Exotics Novello Impact on Esters & Thiols in Sauvignon blanc**

<table>
<thead>
<tr>
<th>ethyl esters</th>
<th>thiols</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>780</td>
</tr>
<tr>
<td>2475</td>
<td>1550</td>
</tr>
<tr>
<td>2400</td>
<td>1550</td>
</tr>
</tbody>
</table>

**Fermivin Champion**

Fructophilic yeast for restarting stuck fermentations

<table>
<thead>
<tr>
<th>Restort Stuck Fermentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>#17143</td>
</tr>
<tr>
<td>500 g</td>
</tr>
<tr>
<td>$80.00</td>
</tr>
</tbody>
</table>

Fermivin® Champion has an excellent capacity to metabolise fructose, making it a good choice for restarting stuck fermentations when the glucose-to-fructose ratio isn't favorable. Fermivin Champion can be added as a preventative measure towards the end of high (initial) Brix fermentations with no pre-acclimatization if the ethanol is <10% (v/v).

Fermivin Champion helps preserve the varietal character of the must/juice when restarting a stuck fermentation. Does not produce secondary aromas. This Saccharomyces cerevisiae hapaeus strain was selected in Alsace by INRA of Narbonne, France.

**Fermivin MT48**

Fruity and spicy reds

<table>
<thead>
<tr>
<th>Fruit Forward Reds</th>
</tr>
</thead>
<tbody>
<tr>
<td>#17106</td>
</tr>
<tr>
<td>500 g</td>
</tr>
<tr>
<td>$46.00</td>
</tr>
</tbody>
</table>

Fermivin® MT48 enhances aromatic notes of cherry, raspberry, blackberry, plum and spices in Bordeaux varieties. Product excellent results in Sangiovese, Grenache and Tempranillo. Fermivin MT48 has a short to medium lag phase, rapid and steady kineries and low volatile acidity production. Produce high glycerol.

Fermivin MT48 was selected in Bordeaux by the IFV (formerly ITV) France in collaboration with CIVB-Bordeaux.

**Fermivin D47**

Complex whites with citrus and floral expression

<table>
<thead>
<tr>
<th>Chardonnay, Rosé, Rhône Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15464</td>
</tr>
<tr>
<td>50 kg</td>
</tr>
<tr>
<td>$60.00</td>
</tr>
</tbody>
</table>

Fermivin D47™ is a high polysaccharide producer and produces wines known for accentuated fruit and volume. IVV D47 is known for the production of full-bodied, barrel-fermented Chardonnay and other white varietals. Excellent for blending with wines made with Lalvin ICV D21™. Short lag phase followed by a regular fermentation. Will tolerate a fermentation temperature range of 15-28°C(59–82°F), however a temperature range of 15-20°C(59–68°F) is preferred. This isolate is from Suse-la-Rousse in the Côtes du Rhône in France.

**Fermivin D21**

Freshness and mouthfeel for mature and concentrated reds and whites

<table>
<thead>
<tr>
<th>Structured Reds</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15143</td>
</tr>
<tr>
<td>10 kg</td>
</tr>
<tr>
<td>$60.00</td>
</tr>
</tbody>
</table>

Lalvin ICV D21™ was selected for fermenting red wines with stable color, intense fore-mouth volume, mid-palate tannin structure and fresh aftertaste. Contributes both higher acidity perception and positive phenol-reactive polysaccharides leading to a more stable aromatic profile in the mouth.

Strain can be used with ripe white grapes that are barrel-fermented to develop fresh fruit aroma, volume and perceived acidity. Noted for its good fermentation performance and low sulfide production. In highly clarified juices, maintain fermentation temperatures above 16°C(61°F) and supplement with proper nutrition.

ICV D21 was isolated from one of the best Languedoc terroirs during a special regional program run by the Institut Coopératif du Vin (ICV) Natural Micro-Flora Observatory and Conservatory in France.

**ICV D47**

Complex whites with citrus and floral expression

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**ICV D47**

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Yeast

Yeast

Yeast from a Rhône Valley Syrah fermentation. This strain was isolated by the Institut Coopératif du Vin (ICV) of INRA, SupAgro Montpellier, the ICV and Lallemand for very low to no sulfur yeasts.

ICV OKAY has very good synergy with malolactic bacteria. Very short lag phase with steady fermentation kinetics. Low volatile acidity production. ICV OKAY™ is recommended for fresh and aromatic wines.

Lalvin ICV Opale 2.0™ enhances varietal character and aromatics in high-maturity/high Brix grapes that might otherwise produce neutral wines. Complements intense and complex fruit aromas in premium white and rosé wines.

In reds, Lalvin ICV GRE™ complements up-front fruit for easy-to-drink Rhône-style wines. With short skin contact (three to five days), ICV GRE reduces vegetal and undesirable sulfur components in varieties like Merlot, Cabernet Sauvignon, Grenache and Syrah.

ICV GRE is a rapid starter, with good alcohol tolerance and low volatile acidity production.

In red wines, Lalvin ICV D254™ develops ripe fruit, jam and cedar aromas together with mild spiciness. On the palate it contributes high fore-mouset volume, big mid-palate mouthfeel and intense fine-grain tannins in reds.

When used for white wines (particularly Chardonnay), sensory descriptors include butterscotch, hazelnut and almond aromas. This strain was isolated by the Institut Coopératif du Vin (ICV) from a Rhône Valley Syrah fermentation.

In reds, Lalvin ICV GRE™ complements up-front fruit for easy-to-drink Rhône-style wines. With short skin contact (three to five days), ICV GRE reduces vegetal and undesirable sulfur components in varieties like Merlot, Cabernet Sauvignon, Grenache and Syrah.

In fruit-focused whites, such as Chenin blanc, Riesling and Rhône whites, ICV GRE fermentations result in stable, fresh fruit characteristics such as melon and apricot while improving fore-mouth impact.

ICV GRE is a rapid starter, with good alcohol tolerance and low volatile acidity production.

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In fruit-focused whites, such as Chenin blanc, Riesling and Rhône whites, ICV GRE fermentations result in stable, fresh fruit characteristics such as melon and apricot while improving fore-mouth impact.

ICV GRE is a rapid starter, with good alcohol tolerance and low volatile acidity production.
K1 (V1116)

Strong fermenter for easter production and challenging conditions
Rezist Stuck Fermentations, Sauvignon blanc, Chenin blanc, Sparkling wine

- #15063 500 g $28.00
- #15077 10 kg $270.00

Lalvin K1 (V1116)™ is one of the highest ester producing strains in our portfolio. When fermented at low temperatures (16°C/61°F) with proper nutrition, it is a strong floral ester producer, especially in neutral or high-yielding varieties. K1 (V1116) performs well in difficult conditions such as extreme temperatures, high alcohol (18% v/v) and low turbidity and is useful in restarting stuck fermentations, especially when relative fructose levels remain high.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–90°F

**Alcohol Tolerance:** 16%

---

MSB

Enhances Sauvignon blanc varietal characters
Sauvignon Blanc, Colombard

- #15267 1 kg $46.00

Lalvin MSB™ is a yeast strain isolated from the Marlborough Valley in New Zealand by the Lallemand R&D team. This strain enhances fruity, tropical and citrus notes, while maintaining a balanced mouthfeel. Maintains the natural acidity of grapes due to negligible malic acid uptake.

To optimize this strain, use in conjunction with our yeast nutrient, Stimula Sauvignon Blanc™ (see pg 47 for more information).

**Effect of Stimula Sauvignon Blanc™ on Thiol Production in a Wine Fermented with Lalvin MSB™**

<table>
<thead>
<tr>
<th>4HPD (ng/L)</th>
<th>3MH (ng/L)</th>
<th>3MHA (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.3</td>
<td>33.6</td>
<td>99.0</td>
</tr>
</tbody>
</table>

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 54–83°F

**Alcohol Tolerance:** 16%

---

NT 116

All-purpose strain for new world style whites and reds
Syrah, Cabernet Sauvignon, Merlot, Petite Sirah, Pinot gris, Aromatic Whites

- #15385 1 kg $94.00
- #15226 10 kg $672.00

NT 116 is equally suited for both white and red winemaking. Its ability to reveal volatile thiols and produce esters makes it suitable for aromatic white wine production. Wines are crisp and fresh with citrus and zest aromas. Also suitable for full-bodied, high maturity red wines destined for oak aging.

Temperature control is advised when using this low foaming, vigorous strain. This hybrid strain of S. cerevisiae is a product of the yeast hybridization program of Infruitec-NietoVoeborg, the wine and vine institute of the Agricultural Research Council in Stellenbosch, South Africa.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–82°F

**Alcohol Tolerance:** 16%

---

MQA23

Strong fermenter for varietal expression in highly clarified musts
Chardonnay, Sauvignon blanc, Gewurztraminer, Pinot blanc, Albarino, Muscat, Aromatic Whites

- #15652 500 g $49.00
- #15653 10 kg $592.00

Lalvin MQA23™ is an excellent thiol converter making it a complementary yeast for developing varietal Sauvignon blanc passion fruit character.

Large amounts of the enzyme beta-glucoisidase are produced during growth which allows for the release of bound terpenes in aromatic varieties.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–90°F

**Alcohol Tolerance:** 16%

---

PERSY

Sulfur management and mouthfeel in red wines
Rhône reds, Pinot noir, Tempranillo or other varieties susceptible to hydrogen sulfide production

- #15361 500 g $46.00
- #15362 10 kg $560.00

Red wines fermented with Lalvin Perys™ have a balanced mouthfeel with fruit forward persistent aromas and flavors optimizing varietal expression.

Using good fermentation practices, Perys produces very low to no H₂S, SO₂, or volatile acidity and is compatible with malolactic bacteria.

This hybrid yeast strain was developed for use in red wines produced from varieties naturally susceptible to H₂S. It was developed in collaboration with INRA, SupAgro Montpellier and Lallemand.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–82°F

**Alcohol Tolerance:** 16%

---

NT 202

Structured and complex reds
Cabernet Sauvignon, Pinot noir, Merlot, Malbec, Structured Reds

- #15191 1 kg $49.00
- #15227 10 kg $672.00

NT 202 is an aromatic red wine yeast that promotes blackcurrant, blackberry and plum-like flavors.

This strain has a stimulatory effect on malolactic fermentation and good fructose utilization. Fermentation temperature should be monitored to control the speed. Not suitable for cold soaking.

This low foaming, hybrid strain of S. cerevisiae is a product of the yeast hybridization program of Infruitec-Nietvoorbij, the wine and vine institute of the Agricultural Research Council in Stellenbosch, South Africa.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–82°F

**Alcohol Tolerance:** 16%

---

Viteivue MT™

High maturity, long-aging Bordeaux varieties
Merlot, Cabernet Sauvignon, Petit Verdot, Structured Reds

- #15650 500 g $49.00
- #15651 10 kg $592.00

Viteivue MT™ is recommended for grapes with high maturity and long aging potential.

Known for producing aromas of strawberry and caramel, especially in Merlot. MT fermented wines have good color intensity and tannin structure.

Has steady fermentation kinetics. This strain benefits from a balanced nutrient strategy. When good fermentation practices are followed MT produces minimal volatile acidity and H₂S.

This low foaming, vigorous strain is useful in restarting stuck fermentations, especially in Merlot. MT fermented wines have good color intensity and tannin structure.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 59–90°F

**Alcohol Tolerance:** 16%

---

MBS

Provenance style rosés
Rosé

- #15674 500 g $49.00

Viteivue MBS™ increases color stability in rosé as a result of its polysaccharide production. Produces round and balanced roses with enhanced fresh fruit aromas.

MBS is particularly well adapted for rosé winemaking in warmer regions. It has good implantation, strong fermentation kinetics, and low volatile acidity and SO₂ production.

This strain was selected by the Laboratoire Aubanelle in the Bandol appellation of Provence.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 63–82°F

**Alcohol Tolerance:** 15%

---

Viteivue NT 202

Large amounts of the enzyme beta-glucosidase are produced during growth which allows for the release of bound terpenes in aromatic varieties.

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 64–82°F

**Alcohol Tolerance:** 16%

---

**Effect of Stimula Sauvignon Blanc™ on Thiol Production in a Wine Fermented with Lalvin MSB™**

<table>
<thead>
<tr>
<th>4HPD (ng/L)</th>
<th>3MH (ng/L)</th>
<th>3MHA (ng/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.3</td>
<td>33.6</td>
<td>99.0</td>
</tr>
</tbody>
</table>

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 54–83°F

**Alcohol Tolerance:** 16%

---

**Effect of Stimula Sauvignon Blanc™ on Thiol Production in a Wine Fermented with Lalvin MSB™**

<table>
<thead>
<tr>
<th>4HPD (ng/L)</th>
<th>3MH (ng/L)</th>
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<tbody>
<tr>
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<td>33.6</td>
<td>99.0</td>
</tr>
</tbody>
</table>

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 54–83°F

**Alcohol Tolerance:** 16%

---

**Effect of Stimula Sauvignon Blanc™ on Thiol Production in a Wine Fermented with Lalvin MSB™**

<table>
<thead>
<tr>
<th>4HPD (ng/L)</th>
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<tbody>
<tr>
<td>15.3</td>
<td>33.6</td>
<td>99.0</td>
</tr>
</tbody>
</table>

**Nitrogen Needs:** MEDIUM

**Temp. Range:** 54–83°F

**Alcohol Tolerance:** 16%
Yeast

Yeast

RC212 (BOURGOROUGE)

This produce VA without proper nutrition. Known to ferment in conditions as low as 5°C (41°F). Tends to produce VA without proper nutrition. This Saccharomyces cerevisiae strain was isolated in the Sauternes region of Bordeaux, France, by Brian Croser of South Australia.

Nitrogen Needs: HIGH
Tolerance: 16%
Temp. Range: 50-86°F

R2

Expression of varietal aromas at cold temperatures
Riesling, Gewürztraminer, Late Harvest, Aromatic Whites

#15071 500 g $46.00

Lalvin R2™ can enhance varietal characters due to the enzymatic release of aroma precursors producing intense, direct fruit-style whites with heightened fruity and floral aromas. Has excellent cold temperature properties and has been known to ferment in conditions as low as 5°C (41°F). Tends to produce VA without proper nutrition. This Saccharomyces cerevisiae strain was isolated in the Sauternes region of Bordeaux, France, by Brian Croser of South Australia.

Nitrogen Needs: HIGH
Tolerance: 16%
Temp. Range: 50-86°F

RHÔNE 2226

Complexity and balance in high alcohol reds
Merlot, Zinfandel, Sangiovese, Barbero, Cabernet Franc, Petite Sirah, Structured Reds

#15654 500 g $46.00
#15655 10 kg $560.00

Lalvin Rhône 2226™ contributes to wine quality by enhancing varietal aroma expression, tannin structure and high color intensity in high-alcohol reds. Produces aromas of black cherry, berry and cherry cola in red wines.

Nitrogen Needs: HIGH
Temp. Range: 59-82°F

R2

Expression of varietal aromas at cold temperatures
Riesling, Gewürztraminer, Sauvignon blanc, Vognier, Rhône Whites, Aromatic Whites

#15130 500 g $46.00

Lalvin R-HST™ retains fresh varietal character while contributing structure and mouthfeel. It can produce crisp, premium white wines with citrus and floral notes. Tolerates fermentation temperatures as low as 10°C (50°F), however, allow the temperature to increase toward the end for a clean finish. Short lag phase and generation time, even at cold temperatures. R-HST dominates and persist over spoilage yeast such as Kloeckera apiculata.

Nitrogen Needs: HIGH
Tolerance: 18%
Temp. Range: 59-82°F

RHÔNE 4600

Aromatic and elegant whites and rosés
Rosé, Vognier, Chardonnay, Rhône Whites

#15171 500 g $46.00

Lalvin Rhône 4600™ produces wines with complex aromatic notes. Noted for elevating fresh fruit aromas (apple, pear, strawberry) this strain is ideal for rosé and Rhône-style whites. Can produce fatty-acid ethyl esters (apricot and tropical fruit flavors) when fermented in high-sugar, low nutrient musts at cool temperatures 13.5°C (56°F).

Nitrogen Needs: MEDIUM
Temp. Range: 60-86°F

RP15

Complex, balanced and concentrated reds
Syrah, Zinfandel, Merlot, Cabernet Sauvignon, Cabernet Franc, Petite Sirah, Malbec, Petit Verdot, Structured Reds

#15665 500 g $49.00
#15666 10 kg $592.00

Enoferm RP15™ is recommended for medium to full bodied reds to produce a rich, lush, balanced mouthfeel. Wines are characterized by red fruit and mineral notes. Contributes a rich mid-palate structure and enhances varietal fruit characters and helps to stabilize yeast. Rehydrating the yeast in Go-Ferm Protect Evolution™ (see pg 45) tends to improve the aromatic profile of this yeast.

Nitrogen Needs: MEDIUM
Temp. Range: 50-86°F

BRL97™ to achieve more complexity.
Wines fermented with Enoferm AMH™, Lalvin W15™ or Lalvin W15™ are fermented with Lalvin Rhône 2226™ are ideal for rosé and Rhône-style whites. More complexity.

Nitrogen Needs: MEDIUM
Temp. Range: 50-86°F

R-HST

For mega expression of grassy thiols
Sauvignon blanc, Chenin blanc

#15208 500 g $50.00
#15272 10 kg $604.00

Sauvignon™ was selected for its exceptional ability to uptake and reveal volatile thiols, especially 4MMP (passion fruit/black currant/gooseberry). Even in grapes where there are low levels of the thiol precursors the resulting wine expresses the 4MMP/green thiol character.

Sauvy™ enhances structure and color for Pinot noir
Pinot noir, Grenache, Rosé

#15171 500 g $46.00

Impact of Sauvy™ on Volatile Thiols in 2019 Napa Valley Sauvignon blanc

Nitrogen Needs: MEDIUM
Temp. Range: 57-68°F

SENSY

Sulfur management and aromatic finesse for whites and reds
Rosé, Sauvignon blanc, Pinot blanc

#15225 500 g $46.00

Lalvin Sensy™ respects varietal aromas and promotes aromatic esters while balancing mouthfeel and freshness in aromatic white wines. Sensy has a short lag phase, is malolactic bacteria friendly and produces very low to no SO2 or H2S, even under low temperature and NTU white winemaking conditions. Avoid adding >50 ppm SO2 at the crusher.

This hybrid strain of S. cerevisiae was selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemand as part of an innovative portfolio of yeast to control the production of negative sulfur compounds. As part of an innovative portfolio of yeast to control the production of negative sulfur compounds.

Nitrogen Needs: MEDIUM
Temp. Range: 54-64°F

SAUVY

For mega expression of grassy thiols
Sauvignon blanc, Chenin blanc

#15208 500 g $50.00
#15272 10 kg $604.00

Sauvignon™ was selected for its exceptional ability to uptake and reveal volatile thiols, especially 4MMP (passion fruit/black currant/gooseberry). Even in grapes where there are low levels of the thiol precursors the resulting wine expresses the 4MMP/green thiol character.

Sauvy™ enhances structure and color for Pinot noir
Pinot noir, Grenache, Rosé

#15171 500 g $46.00

Impact of Sauvy™ on Volatile Thiols in 2019 Napa Valley Sauvignon blanc

Nitrogen Needs: MEDIUM
Temp. Range: 57-68°F

SENSY

Sulfur management and aromatic finesse for whites and reds
Rosé, Sauvignon blanc, Pinot blanc

#15225 500 g $46.00

Lalvin Sensy™ respects varietal aromas and promotes aromatic esters while balancing mouthfeel and freshness in aromatic white wines. Sensy has a short lag phase, is malolactic bacteria friendly and produces very low to no SO2 or H2S, even under low temperature and NTU white winemaking conditions. Avoid adding >50 ppm SO2 at the crusher.

This hybrid strain of S. cerevisiae was selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemand as part of an innovative portfolio of yeast to control the production of negative sulfur compounds.

Nitrogen Needs: MEDIUM
Temp. Range: 54-64°F

SAUVY

For mega expression of grassy thiols
Sauvignon blanc, Chenin blanc

#15208 500 g $50.00
#15272 10 kg $604.00

Sauvignon™ was selected for its exceptional ability to uptake and reveal volatile thiols, especially 4MMP (passion fruit/black currant/gooseberry). Even in grapes where there are low levels of the thiol precursors the resulting wine expresses the 4MMP/green thiol character.

Sauvy™ enhances structure and color for Pinot noir
Pinot noir, Grenache, Rosé

#15171 500 g $46.00

Impact of Sauvy™ on Volatile Thiols in 2019 Napa Valley Sauvignon blanc

Nitrogen Needs: MEDIUM
Temp. Range: 57-68°F

SENSY

Sulfur management and aromatic finesse for whites and reds
Rosé, Sauvignon blanc, Pinot blanc

#15225 500 g $46.00

Lalvin Sensy™ respects varietal aromas and promotes aromatic esters while balancing mouthfeel and freshness in aromatic white wines. Sensy has a short lag phase, is malolactic bacteria friendly and produces very low to no SO2 or H2S, even under low temperature and NTU white winemaking conditions. Avoid adding >50 ppm SO2 at the crusher.

This hybrid strain of S. cerevisiae was selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemand as part of an innovative portfolio of yeast to control the production of negative sulfur compounds.

Nitrogen Needs: MEDIUM
Temp. Range: 54-64°F

SAUVY

For mega expression of grassy thiols
Sauvignon blanc, Chenin blanc

#15208 500 g $50.00
#15272 10 kg $604.00

Sauvignon™ was selected for its exceptional ability to uptake and reveal volatile thiols, especially 4MMP (passion fruit/black currant/gooseberry). Even in grapes where there are low levels of the thiol precursors the resulting wine expresses the 4MMP/green thiol character.

Sauvy™ enhances structure and color for Pinot noir
Pinot noir, Grenache, Rosé

#15171 500 g $46.00

Impact of Sauvy™ on Volatile Thiols in 2019 Napa Valley Sauvignon blanc

Nitrogen Needs: MEDIUM
Temp. Range: 57-68°F

SENSY

Sulfur management and aromatic finesse for whites and reds
Rosé, Sauvignon blanc, Pinot blanc

#15225 500 g $46.00

Lalvin Sensy™ respects varietal aromas and promotes aromatic esters while balancing mouthfeel and freshness in aromatic white wines. Sensy has a short lag phase, is malolactic bacteria friendly and produces very low to no SO2 or H2S, even under low temperature and NTU white winemaking conditions. Avoid adding >50 ppm SO2 at the crusher.

This hybrid strain of S. cerevisiae was selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemand as part of an innovative portfolio of yeast to control the production of negative sulfur compounds.

Nitrogen Needs: MEDIUM
Temp. Range: 54-64°F
Enoferm Syrah™ offers good mouthfeel and stable color extraction. Tends to produce high levels of β-damascenone, which promotes violet and red fruit aromas. Typical aromas include violets, raspberries, blackberries, and black pepper which enhance and respect the varietal character. This strain has a tendency to produce H₂S under low YAN conditions hence rehydration with Go-Ferm Protect Evolution™ and thoughtful nutrition management is essential. This strain that was isolated from the Côtes du Rhône region of France.

This yeast strain was isolated by La Universidad de Valencia of Spain in collaboration with Lallemand. Lalvin Tango Malbec™ respects varietal character and promotes intense color. Tango Malbec produces full bodied red wines with aromatic complexity including flavors of violet, black cherry, blackberry, raspberry, dark plum and anise. Its interactions with polyphenolic compounds creates wines with good structure, balance and the natural sweetness associated with Malbec. It is a low H₂S and SO₂ producer and malolactic friendly. Tango Malbec was isolated by the National Institute of Agricultural Technology in La Consulta, Uco Valley, Mendoza, Argentina.

## Syrah

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15657</td>
<td>Syrah, Merlot, Mourvèdre, Petite Sirah, Petit Verdot, Structured Reds</td>
<td>10 kg</td>
<td>MEDIUM</td>
<td>59–90°F</td>
<td>$892.00</td>
</tr>
<tr>
<td>#15658</td>
<td></td>
<td>500 g</td>
<td>MEDIUM</td>
<td>59–90°F</td>
<td>$49.00</td>
</tr>
</tbody>
</table>

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### T73

**Strong fermenter for varied complexity in high-alcohol reds**

Merlot, Zinfandel, Sangiovese, Tempranillo, Fruit Forward Reds

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15091</td>
<td></td>
<td>500 g</td>
<td>MEDIUM</td>
<td>59–90°F</td>
<td>$46.00</td>
</tr>
</tbody>
</table>

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### VIN 13

**Strong fermenter for thiol expression**

Sauvignon blanc, Chenin blanc, Chardonnay, Rosé, Gewürztraminer, Muscat, Albariño, Rhône Whites, Aromatic Whites, Reztstuck Fermentations

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15183</td>
<td></td>
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<td>MEDIUM</td>
<td>55-61°F</td>
<td>$94.00</td>
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<tr>
<td>#15228</td>
<td></td>
<td>10 kg</td>
<td>MEDIUM</td>
<td>55-61°F</td>
<td>$672.00</td>
</tr>
</tbody>
</table>

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### VIN 2000

**Full bodied, Aromatic Whites**

Chenin blanc, Chardonnay, Sauvignon blanc, Viognier, Albariño

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15195</td>
<td></td>
<td>1 kg</td>
<td>MEDIUM</td>
<td>55-61°F</td>
<td>$94.00</td>
</tr>
</tbody>
</table>

---

### W15

**Ferments cleanly at low temperatures**

Gewürztraminer, Reisling, Pinot gris, Syrah, Rosé, Aromatic Whites, Rhône Whites

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15118</td>
<td></td>
<td>500 g</td>
<td>MEDIUM</td>
<td>50-81°F</td>
<td>$46.00</td>
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<td></td>
<td>10 kg</td>
<td>MEDIUM</td>
<td>50-81°F</td>
<td>$560.00</td>
</tr>
</tbody>
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### VRB

**Balance and mouthfeel in high alcohol reds**

Tempranillo, Barbera, Sangiovese, Zinfandel, Petite Sirah, Fruit Forward Reds

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15173</td>
<td></td>
<td>500 g</td>
<td>LOW</td>
<td>54-61°F</td>
<td>$46.00</td>
</tr>
</tbody>
</table>

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### VRB

**Balance and mouthfeel in high alcohol reds**

Tempranillo, Barbera, Sangiovese, Zinfandel, Petite Sirah, Fruit Forward Reds

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<tr>
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<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15173</td>
<td></td>
<td>500 g</td>
<td>LOW</td>
<td>54-61°F</td>
<td>$46.00</td>
</tr>
</tbody>
</table>

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### VIN 2000

**Full bodied, Aromatic Whites**

Chenin blanc, Chardonnay, Sauvignon blanc, Viognier, Albariño

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Description</th>
<th>Alcohol Tolerance</th>
<th>Nitrogen Needs</th>
<th>Temp. Range</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15195</td>
<td></td>
<td>1 kg</td>
<td>MEDIUM</td>
<td>55-61°F</td>
<td>$94.00</td>
</tr>
</tbody>
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---

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**Full bodied, Aromatic Whites**

Chenin blanc, Chardonnay, Sauvignon blanc, Viognier, Albariño

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<td>1 kg</td>
<td>MEDIUM</td>
<td>55-61°F</td>
<td>$94.00</td>
</tr>
</tbody>
</table>

---
"Non-Saccharomyces" is the colloquial term for yeast strains associated with vineyards or wineries that are not from the Saccharomyces genus. Due to their unpredictable nature and their ability to produce acetic acid and other undesirable characteristics, non-Saccharomyces have a bad reputation. However, specific organisms within this group have been shown to contribute positively during the pre-fermentative and early fermentation stages. We have gained a better appreciation for these yeasts and use them as bioprotectors, to enhance the aromatic potential of grapes, and to naturally increase wine acidity.

Non-Saccharomyces are not strong fermenters and they require different handling than regular wine yeast. It is important to follow the specific handling recommendations and inoculate with a Saccharomyces species to complete the alcoholic fermentation.

**SELECTING NON-SACCHAROMYCES FOR SUCCESS**

**BIODIVA**

For enhancing complexity and fruit in whites, reds, late harvest, icewine.

Rehydration

<table>
<thead>
<tr>
<th>Recommended Dosage</th>
<th>Usage</th>
<th>Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 ppm</td>
<td>25 g/L</td>
<td>2 lb/1000 gal</td>
</tr>
</tbody>
</table>

Biodiva™ is a pure culture of Torulaspora delbrueckii that can enhance the aroma profile and complexity of wines (see figure at right). This non-Saccharomyces yeast is an ester producer and can also produce components that lead to a fuller mouthfeel. Biodiva is oenocytar making it a good choice for high sugar fermentations, late harvest and icewine production as it can remove the other sugar due to its α-carboxyferulic acid activity and S. cerevisiae can remove the other sugar due to its β-glucosidase activity. Flavia also has the ability to release bound thiols. Wines made using Flavia have enhanced floral aromas (see figure below).

**FLAVIA**

For revelation of terpenes and thiols in aromatic whites and rosés.

Rehydration

<table>
<thead>
<tr>
<th>Recommended Dosage</th>
<th>Usage</th>
<th>Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 ppm</td>
<td>25 g/L</td>
<td>2 lb/1000 gal</td>
</tr>
</tbody>
</table>

Flavia™ is a pure culture of Metschnikowia pulcherrima used for its ability to liberate bound thiols and terpenes in grapes. Bound thiols and terpenes are odorless and flavorless but are odor-active when released contributing to tropical, citrus and floral aromas.

Bound terpenes are attached to two sugar molecules and require two different actions to release them. Flavia has the ability to remove one sugar due to its α-carboxyferulic acid activity and S. cerevisiae can remove the other sugar due to its β-glucosidase activity. Flavia also has the ability to release bound thiols. Wines made using Flavia have enhanced floral aromas (see figure below).

This strain was selected in conjunction with the Universidad de Santiago de Chile (USACH).

**GAIA**

For managing spoilage risks when transporting grapes or juice, or cold soaking reds.

Rehydration

<table>
<thead>
<tr>
<th>Recommended Dosage</th>
<th>Usage</th>
<th>Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 ppm</td>
<td>25 g/L</td>
<td>2 lb/1000 gal</td>
</tr>
</tbody>
</table>

GAIA™ is non-fermentative but implants and multiples quickly, controlling the production of ethyl acetate and acetic acid from Kloeckera apiculata (see figure below), acetic acid bacteria, and other native microflora. GAIA can protect your grapes during a pre-fermentative cold soak for up to five days if the temperature is 10°C (50°F). Although GAIA was selected for its use as a bioprotector, it can also help to preserve fruit characteristics and aroma.

**Why would you even consider cold soak in 2020 without Gaia?**

Preservation of fruit and aromatic expression with less risk of volatile acidity during maceration, it is the perfect use of a non-Saccharomyces to prevent spoilage. A must to Kloeckera apiculata! —Shirley Molinar, Technical Support - Lallemand Oenology, based in Sonoma County, CA.
Laktia™ is a pure culture of Lachancea thermotolerans isolated from the Rioja region of Spain. It is added at the beginning of fermentation where it produces lactic acid from sugar, bringing a freshness and aromatic complexity to wines. Laktia gives winemakers an interesting blending opportunity for wines lacking in acidity (Figure 2). Laktia is recommended for red musts but has been used successfully used in whites. Although Laktia produces some alcohol, it does not have the ability to complete the alcoholic fermentation. It must be followed up after 24-72 hours with S. cerevisiae. It is important to note that lactic acid >3g/L can inhibit malolactic ability to complete the alcoholic fermentation. It must be followed up immediately. After 24 hours a compatible S. cerevisiae strain should be inoculated following the recommended Saccharomyces rehydration protocol (see pg 36) and using Go-Ferm Protect Evolution™. Due to consumption of nitrogen by Laktia, YAN should be measured and supplemented as necessary when Saccharomyces is inoculated.

Usage

Prior to inoculation ensure the free SO₂ is <15ppm, temperature >17°C(63°F) and YAN >150ppm. Rehydrate Laktia in ten times its weight of chlorine free, 30°C(86°F) water and stir gently. After 15 minutes stir gently again. Slowly combine some of the must with the rehydrated yeast to drop the temperature 10°C(18°F) and hold for 15 minutes. This step may need repeating until you are within 10°C(18°F) of the must temperature, however the process should not exceed 45 minutes. After 24 hours a compatible S. cerevisiae strain should be inoculated following the recommended Saccharomyces rehydration protocol (see pg 36) and using Go-Ferm Protect Evolution™. Due to consumption of nitrogen by Laktia, YAN should be measured and supplemented as necessary when Saccharomyces is inoculated.

Storage

Store for 24 months at 4°C(39°F). Once opened use immediately.

Impact of Laktia on Acidity in a 2017 Tempranillo

<table>
<thead>
<tr>
<th>pH</th>
<th>Titratable Acidity</th>
<th>L-Lactic Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4</td>
<td>9%</td>
<td>0.1</td>
</tr>
<tr>
<td>3.5</td>
<td>9%</td>
<td>0.1</td>
</tr>
<tr>
<td>9.7</td>
<td>9%</td>
<td>0.1</td>
</tr>
<tr>
<td>3.3</td>
<td>9%</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Impact: Adds freshness due to lactic acid production.

Add Saccharomyces: After 24-72 hours

Recommended Dosage

<table>
<thead>
<tr>
<th>Dosage</th>
<th>250ppm</th>
<th>25g/HL</th>
<th>2 lb/1000 gal</th>
</tr>
</thead>
</table>

Note: This protocol is not appropriate for non-Saccharomyces yeast. Please see individual product descriptions for rehydration guidelines (pgs 33-35).

1. Suspend 2.5 lb/1000 gal (30 g/HL) of Go-Ferm or Go-Ferm Protect Evolution in 20 times its weight of clean, chlorine free, 43°C(110°F) water. (For example: 2.5 lb rehydration nutrient x 20 = 50 + 8.33 lb/gal water = 6 gal water.) The water temperature is important for mixing of the rehydration nutrient. Due to the unique nature of Go-Ferm and Go-Ferm Protect Evolution, they will not go into solution completely. This is due to the fatty acid and sterol content. Please see page 45-46 for information on yeast rehydration nutrients.

Important: If not using a yeast rehydration nutrient, water temperature should begin at 40°C(104°F) and the volume of water should be 10 times the weight of the yeast amount. This lower temperature is important so you do not harm the yeast.

2. Once the temperature of the yeast rehydration nutrient solution has dropped to 40°C(104°F), add 2 lb/1000 gal (25 g/HL)* of active dried yeast. Stir gently to break up any clumps. Let suspension stand for 20 minutes, then stir gently again. Live yeast populations decline when allowed to stand for more than 30 minutes.

Note: Foaming is not an indicator of yeast viability.

RecommendedDosage

Proper yeast rehydration is one of the most important steps to ensure a strong and healthy fermentation. Normal inoculation rate for wine active dried yeast is 2 lb/1000 gal (25 g/HL). When added properly, this inoculation rate results in an initial yeast cell concentration of 3–4 million viable cells per mL of must/juice. Under favorable conditions, the initial yeast cell population will increase up to 100–150 million viable cells per mL of must/juice before growth stops and alcoholic fermentation begins. This biomass increase is critical for healthy fermentations. Higher inoculation rates are recommended on grapes that are higher maturity (higher sugar). When using a yeast rehydration nutrient such as Go-Ferm™ or Go-Ferm Protect Evolution™, maintain a ratio of 1 part yeast to 1.25 parts rehydration nutrient. Careful rehydration, aeration, inoculation and homogenization are all important to help prevent sluggish or stuck fermentations.

Note: Copies of “Easy Steps for Optimal Yeast Rehydration” may be downloaded in Spanish, French and English from our website (scottlab.com).

*aThe yeast dosage can vary depending on the initial lb/HL, manufacturer’s recommendations and the sanitary state of the grapes or wort.

Visit scottlab.com for a video animation of this protocol.
**RECOMMENDED METHOD TO RESTART A STICK FERMENTATION USING UVAFERM 43 RESTART™ FOR 1000 GALS OF STICK WINE**

**PREPARE THE STICK WINE**
1. Address any potential spoilage organism concerns with SO₂.
2. Add 2kgs (4.4 lbs) of Go-Ferm Protect Evolution in 10 gallons of water at 43°C (110°F).
3. Cool solution to 40°C (104°F) and add 1.5kgs (3.3 lbs) of Uvaferm 43 RESTART.
4. Wait 20 minutes and slowly acclimate the yeast before adding to the “Pied-de-cuve.”

**PREPARE THE “PIED-DE-CUVE” (STARTER)**
1. Transfer immediately to the full volume of Reskue treated wine.
2. Add 1.5kgs (3.3 lbs) of Ferm oid O™ to tank. Mix to homogenize.
3. Monitor sugar depletion throughout the restart process.

The steps in this protocol can be adapted for volumes of wine other than 1000 gallons.

---

**TROUBLESHOOTING GUIDE FOR SLAGGISH ALCOHOLIC FERMENTATIONS**

Many factors influence the success of a fermentation including yeast strain selection, yeast cell number, yeast handling and inoculation practices, availability of nutrition and oxygen, and temperature management. If a fermentation becomes sluggish or you suspect it may be stuck, it is wise to get a complete picture of the wine before jumping into a full restart. Sometimes a simple adjustment or a mixing can be enough to get a fermentation back on track (refer below).

If a restart is necessary, having all the details will help you determine the best approach.

Recognizing that a fermentation is sluggish or stuck is the first step in rectifying a challenging situation. A fermentation can be viewed as stuck if the sugar has not dropped for >48 hours. A warning sign that a sluggish fermentation may become stuck is when the fermentation approaches <1°Brix and fermentation slows to <0.25°Brix per day (and the temperature is reasonable).

There are a few protocols in our handbook (and more online), that can walk you through the necessary steps to restart a sluggish or stuck fermentation.

### How To

**THE JUICE/ WINE MAY BE TOO CLEAR**
If your juice is clear (>50 NTU), there may not be enough solids to keep the yeast in suspension during the early phases of fermentation. Increasing the turbidity is advised. This can be achieved through an addition of Reskue™ (pg 49), in addition to stirring. A side benefit of Go-Ferm™ and Go-Ferm Protect Evolution™ (pg 45) is that they also help to increase the turbidity of the juice.

**THE YEAST MAY NOT HAVE BEEN PROPERLY ACCLIMATIZED**
Rehydrated yeast must have time to acclimatize to the changes in sugar concentration and temperature of juice/must during inoculation. Improper acclimatization can delay the start of fermentation after inoculation. Our “Saccharomyces Yeast Rehydration” protocol (pg 36) contains proper timing and steps for acclimatization.

**THE YIELD POPULATION IS NOT HEALTHY**
You may have an adequate population, but the cells may not be healthy.

### Starting Sugar

Choosing the correct protocol is essential for a successful outcome. If a fermentation sticks and the sugar level is >3° Brix with an alcohol >11.5% (v/v) it is relatively easy to restart as there are not as many other compounding factors. However, fermentations are more difficult to restart when the alcohol is higher and the sugar is lower.

Our preferred method to restart sluggish and stuck fermentations is the “Recommended Method to Restart a Stuck Fermentation using Uvaferm 43 RESTART™” listed on the next page. This protocol was developed in conjunction with Interhold and is specifically for use with the 43 RESTART yeast strain. Other yeast strains (even ones within our portfolio, including Uvaferm 43™) should not be attempted with this one-step acclimatization protocol. If a different strain like Uvaferm 43, Fermoviva® Champion, Latvin K1 (V1116™) or VIN 13 is preferred for the restart, then the multi-step build-up protocol “Traditional Method to Restart a Stuck Fermentation” on page 39-40 can be used.

**THE WINE MIGHT NEED A DETOXIFICATION**
When wine yeast become stressed, they can produce certain compounds that impede fermentation. Reskue™ (pg 49) can be extremely beneficial in this situation. If possible, Reskue should be added and racked after 48 hours. If you are unable to rack, adding Reskue and leaving it in the wine can still help.

**THE MIGHT THERE BE OTHER MICROBIAL POPULATIONS YOU NEED TO ADDRESS**
Check your malic acid and volatile acidity (VA). If malic acid has dropped, and you have not used malic acid-degrading yeast or bacteria, you may have a lactic acid bacteria (LAB) infection. A strong LAB population can produce VA and inhibit yeast that are already weak at the end of alcoholic fermentation. VA >0.6g/L can be challenging for yeast, especially in high alcohol situations, and anything greater than 0.8g/L can be inhibitory. LAB can be mitigated with Lysovin™ (pg 89) or if malolactic fermentation (MLF) isn’t complete but is desired, or Bactiless™ (pg 90) if MLF is complete or a MLF is not desired. In any condition, uncontrolled LAB should be controlled before attempting to restart a stuck fermentation.

---

**Prepare the Stuck Wine**
1. Address any potential spoilage organism concerns with SO₂.
2. Add 2kgs (4.4 lbs) of Go-Ferm Protect Evolution in 10 gallons of water at 43°C (110°F).
3. Cool solution to 40°C (104°F) and add 1.5kgs (3.3 lbs) of Uvaferm 43 RESTART.
4. Wait 20 minutes and slowly acclimate the yeast before adding to the “Pied-de-cuve.”

**Prepare the “Pied-de-cuve” (starter)**
1. Transfer immediately to the full volume of Reskue treated wine.
2. Add 1.5kgs (3.3 lbs) of Ferm oid O™ to tank. Mix to homogenize.
3. Monitor sugar depletion throughout the restart process.

The steps in this protocol can be adapted for volumes of wine other than 1000 gallons.

---

Our recently introduced Reusable43 Restart protocol has been a game changer for stuck and sluggish fermentations. I’ve seen it solve many problems for winemakers—while saving time and people power!—Mollie Forest, Sales Representative, based in Washington State.
HOW TO

TRADITIONAL METHOD TO RESTART A STUCK FERMENTATION IN WINES >3°BRIX AND <11.5% ALCOHOL

When restarting a sluggish or stuck fermentation, it is essential to address yeast biomass buildup together with the low nutrient levels. A yeast rehydration nutrient such as Go-Ferm Protect Evolution™ is essential, as it is rich in micronutrients and survival factors.

When stuck wines have high residual sugar levels, the addition of a complex nutrient to the stuck wine is also recommended. Unwanted bacteria like Lactobacillus spp. and Oenococcus oeni are often present in stuck fermentations. Adding Lysovin (pg 89) to the stuck wine prior to restarting the fermentation may help control unwanted bacteria and provide an improved environment for the restart to occur.

Adding Reskue™ (pg 49) to the stuck wine prior to restarting the fermentation may also help reduce accumulated toxins and improve chances for a successful restart.

FOR WINES STUCK AT >3°BRIX AND <11.5% (V/V) ALCOHOL

STEPS 1–8
Build-up for Stuck Wine
1. Add 40 g/L (3.3 lb/1000 gal) of Reskue 48 hours prior to restarting.
2. After 48 hours, rack off the Reskue.
3. Add a complex yeast nutrient (Fermaid K™ or Fermaid O™) directly to the tank of stuck wine at a rate of 0.5–1.0 lb/1000 gal (6–12 g/L). Many winemakers also add Lysovin at this time to reduce potential bacteria problems (see page 89).
4. In another clean container mix equal volumes of stuck wine and water. Generally this would total 1% of the total wine volume. (Example: For 1000 gal of stuck wine, use 10 gal water + 10 gal wine.) This container will be the “Mother Restart Tank.”
5. Calculate the amount of Go-Ferm Protect Evolution at the recommended rate. Dissolve this yeast rehydration nutrient in 20 times its weight of clean, chlorine free, 43°C (110°F) water. (Example: 5 lb Go-Ferm Protect Evolution × 20 = 100 lb, divided by 83.3 lb/gal water = 12 gal water needed.) Mix the solution.
6. Select a yeast strain that is both alcohol tolerant and a vigorous fermenter such as Usläferm 48™, Lalvin K1 (V1116™), Fermwin® Champion or VIN 13. Calculate the amount of yeast required for the total volume of stuck wine at 3–5 lb/1000 gal (36–60 g/L). When the rehydration nutrient/water solution temperature has cooled to 40°C (104°F), slowly (over 5 minutes) add yeast. Stir gently to mix and avoid clumping. Let this yeast suspension stand for 20 minutes.
7. Check the temperature of the yeast suspension. There should not be more than 10°C (18°F) difference between the yeast suspension and the diluted wine in the Mother Restart Tank. If there is too great a temperature difference, acclimatization may be required. Cold temperatures may shock the yeast cells.
8. When the yeast suspension is properly rehydrated and proper consideration has been given to temperature differences, add the yeast to the Mother Restart Tank and wait 20–30 minutes.

STEPS 9–12
Inoculation of Stuck Wine
9. Add 10% of stuck wine to the Mother Restart Tank and wait 20–30 minutes. (Example: For 1000 gal stuck wine, add 100 g/L wine.)
10. Add 20% of stuck wine to the Mother Restart Tank and wait 20–30 minutes. (Example: For 1000 gal stuck wine, add 200 g/L wine.)
11a. Repeat step 10.
11b. Repeat step 10.
11c. Repeat step 10.
12. Add any remaining wine to the Mother Restart Tank.

FOR WINES STUCK AT 1–2°BRIX AND <11.5% (V/V) ALCOHOL

Follow this restart protocol, except in Step 3 reduce the complex yeast nutrient addition to 0.5 lb/1000 gal (6 g/L).

FOR WINES STUCK AT <1°BRIX AND <11.5% (V/V) ALCOHOL

Follow this restart protocol, except in Step 3 eliminate the addition of a complex yeast nutrient.
**Yeast Nutrients**

Yeasts are living organisms. When treated well, they survive and thrive. If yeast physical and nutritional needs are understood and met, they can be expected to perform at their peak while converting juice into wine. If yeast needs are not met, however, they become stressed and their performance is hindered. To optimize yeast performance and to encourage a successful fermentation the yeast’s nutritional needs must be met. Yeast require a balance of vitamins, minerals, survival factors and nitrogen.

### SUPPLEMENTING NUTRIENTS FOR SUCCESS

Yeast require nitrogen in a form they can assimilate. Yeast assimilable nitrogen (YAN) consists of most amino acids, ammonia, and some types of peptides. Grapes vary in their YAN content. When determining the YAN content of must/juice, both assimilable amino acids (Proline is non-assimilable) and ammonia need to be measured to determine total YAN. Yeast also need vitamins, minerals and survival factors. Vitamins and minerals are co-factors for growth and aroma metabolism. Interestingly, the higher the YAN content the more vitamins and minerals a yeast requires. Yeast cannot survive without them. Yeast survival factors (sterols and unsaturated fatty acids) are needed for healthy plasma membranes. When yeast have sufficient survival factors, sugar uptake can continue throughout fermentation and the toxic effects of ethanol can be minimized. By providing sterols and unsaturated fatty acids during yeast rehydration, the cells will be off to a great start!

#### HOW MUCH YAN IS REQUIRED?

The amount of YAN yeast require depends on the following:

- Individual yeast strain requirements, initial sugar content, fermentation temperature, oxygenation, turbidity, pre-fermentation practices and fruit quality.
- Yeasts will vary between vintages, vineyards and varietals so it’s necessary to analyze each lot of fruit. Analysis should be conducted as close to yeast inoculation as possible. See more information on nitrogen supplementation and the importance of organic nitrogen on pgs 44.

#### YEAST STRAIN CHOICE

Different yeast strains have different requirements and are classified as low, medium or high.

- Low nitrogen-requiring yeast need 7.5 ppm YAN per 1°Brix.
- Medium nitrogen-requiring yeast need 9 ppm YAN per 1°Brix.
- High nitrogen-requiring yeast need 12.5 ppm YAN per 1°Brix.

#### INITIAL SUGAR CONTENT

The higher the initial sugar content, the more YAN required.

#### TEMPERATURE

An increase in temperature stimulates fermentation rate and yeast growth, thereby requiring increased levels of nitrogen.

#### OXYGEN

When adding more oxygen to the must/juice, nitrogen is captured faster, and more is needed.

#### TURBIDITY

When juice is over-clarified (<50 NTU), many nutritional factors for yeast are removed, making it necessary to supplement with complete and balanced nutrients.

#### PRE-FERMENTATION PRACTICES

Vitamins and minerals are generally consumed (even in healthy fruit) by native microflora. This means that prior to inoculation these essential factors may be deficient.

#### FRUIT QUALITY

The presence of rot will impact grape juice/must chemistry. Studies have shown that grapes impacted by Botrytis cinerea and other molds are deficient in YAN.

### CHOOSING YEAST NUTRIENTS & YEAST DERIVATIVE NUTRIENTS

<table>
<thead>
<tr>
<th><strong>Yeast Nutrients</strong></th>
<th><strong>Yeast Derivative Nutrients</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GNB</strong></td>
<td><strong>Go-Ferm</strong></td>
</tr>
<tr>
<td><strong>Opti-MUM Red</strong></td>
<td><strong>Stimula Sauvignon blanc</strong></td>
</tr>
<tr>
<td><strong>Opti-RED</strong></td>
<td><strong>Stimula Chardonnay</strong></td>
</tr>
<tr>
<td><strong>Opti-WHITE</strong></td>
<td><strong>Reskue</strong></td>
</tr>
<tr>
<td><strong>Glutastar</strong></td>
<td><strong>Fermaid O</strong></td>
</tr>
<tr>
<td><strong>Go-Ferm Protect Evolution</strong></td>
<td><strong>Fermaid K + Fermaid K (Kosher)</strong></td>
</tr>
</tbody>
</table>

*See page 43 for more information on YAN equivalent vs measurable YAN.

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**Page#** 48 48 49 46 45 50 49 46 47 51 52 52 53 53

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**Approved under 27 CFR 24.246**

**Approved under 27 CFR 24.250**

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**Note:** With the exceptions of Fermaid K™ and Fermaid K (Kosher)™, all ingredients of the products shown in the nutrient section of this handbook are listed by the TTB as acceptable in good commercial winemaking practice listed in either 27 CFR 24.246 or 27 CFR 24.250. The ingredients in Fermaid K™ and Fermaid K (Kosher)™ are listed as acceptable in good commercial winemaking practices in either 27 CFR 24.246 or 27 CFR 24.246. For more information please visit www.TTB.gov.
Yeast are living organisms and require a balance of energy sources (sugar), nitrogen-containing compounds, vitamins, minerals, and survival factors to perform at their best. Nitrogen is one of the most important nutrients for yeast and the nitrogen-containing compounds that yeast can use are known as yeast assimilable nitrogen (YAN). YAN comes in two main forms: ammonia, an inorganic source of nitrogen (does not contain carbon), and amino acids which are complex organic-based compounds (containing carbon).

Historically, nitrogen in the form of diammonium phosphate (DAP) has been the focus for yeast nutrition. In fact, most academic recommendations for YAN supplementation are based on DAP addition (see box on Measurable YAN vs YAN Equivalent this page). However, nitrogen supplied as DAP accumulates very quickly which can lead to uncontrolled cell growth and hot fermentations and does not necessarily give yeast the staying power to complete a fermentation. Alternatively, when nitrogen is supplied in the form of amino acids (from autolyzed yeast) the fermentation profiles are very different. Ferments do not get as hot, the yeast population is controlled, and the cells are healthier. Interestingly, both aroma and mouthfeel are also improved when DAP is avoided. Organic and inorganic nitrogen each have a distinct role and impact on fermentation. While yeast may show an affinity for inorganic nitrogen, a yeast diet balanced with organic nitrogen can produce healthier fermentations, better aromatics (e.g. terpenes and esters), and lower levels of undesirable compounds (e.g. ethyl acetate and hydrogen sulfide).

To illustrate the relative effects of different nitrogen sources on fermentation kinetics, trials were done by Lallemand and the ICV in collaboration with the INRA Pech Rouge Research Station in the Languedoc region of France. The purpose of the trials was to compare the efficacy of adding DAP (inorganic nitrogen) versus Fermaid O™. The trial maps and fermentation protocols were identical. The only difference was that one lot received an addition of the equivalent of 16 ppm of YAN in the form of DAP while another received a similar YAN addition from Fermaid O. This addition was split into two for both treatments, with the first addition added at the onset of fermentation and the second addition added at 1/3 sugar depletion. The control received no addition of nitrogen.

The addition of YAN from Fermaid O resulted in a complete fermentation (Figure 2) in approximately 10 days (Figure 1). Further, the fermentation involving only DAP had a significantly slower conclusion and higher final residual sugars than the wine made with Fermaid O (Figure 2). These trials show the importance of the source of yeast available nitrogen.

### NUTRIENT SUPPLEMENTATION PLANNER

In order to conduct a healthy and complete fermentation, yeast require minerals, vitamins, fatty acids, sterols, and nitrogen. Minerals, vitamins, fatty acids and sterols are provided by GoFerm Protect Evolution™, whereas nitrogen is supplied by Fermaid O™ or Fermaid K™. If we consider the individual needs of the yeast, how much fermentable sugar is present and how much nitrogen is required by the yeast under these conditions we can tailor a program designed for success. Use the following step-by-step guide to develop a complete yeast nutrition program for each fermentation:

1. **Choose the yeast strain.** Strains can be found on pages 11-16 and are classified as low, medium or high nitrogen-requiring.
2. **Determine the yeast strain’s Measurable YAN requirement using Table 1.**
3. **Calculate the amount of Measurable YAN that needs to be supplemented:**
   \[
   \text{Measurable YAN requirement} = \text{Yeast Measurable YAN Requirement} - \text{YAN in juice/must}
   \]
4. **Determine fermentation goal and follow program as outlined below:**

#### GOAL — FERMENTATION SECURITY

<table>
<thead>
<tr>
<th>Sugar</th>
<th>Measurable YAN* Requirements (ppm N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0-50 ppm</td>
</tr>
<tr>
<td>Medium</td>
<td>51-100 ppm</td>
</tr>
<tr>
<td>High</td>
<td>101-150 ppm</td>
</tr>
</tbody>
</table>

* based on supplementation with inorganic nitrogen source, see pg 42 for info on YAN Equivalents

#### GOAL — FERMENTATION SECURITY AND REVEALATION OF THIOLS

#### GOAL — FERMENTATION SECURITY AND PRODUCTION OF ESTERS

#### MEASURABLE YAN VS YAN EQUIVALENT

Most academic recommendations for YAN supplementation have been based on measurable YAN, often supplemented in the form of inorganic nitrogen (usually DAP). Lallemand has demonstrated that organic forms of YAN are 4-6 times more efficient than inorganic YAN. This means that a 25 g/dose of Fermaid O has 10 ppm measurable YAN but a YAN equivalent of 40-60 ppm. Throughout our recommendations we have taken this efficiency into account.
The Stimula range is different. These natural yeast autolysates are formulated to supply optimal levels of specific amino acids, vitamins, minerals and sterols that stimulate the yeast cell functions involved in aroma compound revelation and production. When used at specific times during fermentation, ester production, and thiduplication, revelation and release, are increased. The Stimula natural yeast autolysates can be used in any varietal where you wish to optimize thiol expression or ester production.

Yeast rehydration nutrients provide natural micronutrients (vitamins and minerals) and survival factors (sterols and unsaturated fatty acids) to the yeast at the time they can be used most efficiently. Yeast cells soak these nutrients up like a sponge making them biologically available for many essential reactions. Further, nutrients are available for their intended purpose since they are not consumed by competitive microorganisms, bound up by organic acids, anions, polysaccharides and polyphenols, or inactivated by SO₂.

Go-Ferm™ is the original yeast rehydration nutrient and contains a balance of micronutrients. It was developed to enhance fermentation kinetics and to help avoid fermentation problems like hydrogen sulfide.

Stage of winemaking:

- Provides: Natural vitamins & minerals in autolyzed yeast base
- Measurable YAN at 40 g/hL dose: 16 ppm
- YAN equivalents at 40 g/hL dose: 64-96 ppm
- Impact: Stimulates fruity and floral ester production
- Storage: Dated expiration. Store in a dry environment at 18°C (65°F). Once opened, use immediately.

Usage
Mix Stimula Chardonnay in 10 times its weight of clean, chlorine-free water or juice and add to the fermentation at 1/3 sugar depletion. It is essential that the timing of addition is respected. Stimula Chardonnay is not fully soluble. Stir to maintain suspension before and during addition.

Yeast rehydration nutrient; OMRI listed

#15260 1 kg $44.00
#15260 10 kg $383.00

Recommended Dosage
- 30 g/hL 2.5 lb/1000 gal

Stimula Chardonnay™ is a 100% autolyzed yeast added at the end of growth phase, yeast use Stimula Chardonnay's naturally occurring amino acids, riboflavin, biotin, vitamin B6 complexes, sterols, manganese and zinc to produce esters rather than for growth. Esters are desirable and contribute fruity and floral aromas. Stimula Chardonnay optimizes the aromatic potential of white and rosé wines.

Impact of Stimula Chardonnay on Ester Production in Languedoc Chardonnay

- Ethyl hexanoate (fruit/pineapple)
- Ethyl octanoate (fruit)
- Ethyl decanoate (grape)
- 2-Phenylethyl acetate (rose/honey)

<table>
<thead>
<tr>
<th>Compound</th>
<th>YAN contribution:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl hexanoate</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Ethyl octanoate</td>
<td>61%</td>
</tr>
<tr>
<td>Ethyl decanoate</td>
<td>55%</td>
</tr>
<tr>
<td>2-Phenylethyl acetate</td>
<td>32%</td>
</tr>
<tr>
<td>153%</td>
<td></td>
</tr>
</tbody>
</table>

Note: This recommendation is based on a yeast inoculum of a medium ferment (5 g/l). If using more or less yeast, use a ratio of 1 part yeast to 1.25 parts of Go-Ferm.

Usage
Mix Go-Ferm in 20 times its weight of clean 43°C (110°F) water. Let the mixture cool to 40°C (104°F) then add the selected active dried yeast. Let stand for 20 minutes. Slowly (over 5 minutes) add equal amounts of juice/must to be fermented to the yeast slurry. Do not allow more than 10°C (18°F) difference. Acclimatise yeast as necessary (see page 36 for more details).

Storage
Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Stage of Winemaking:
- Provides: Natural vitamins & minerals in autolyzed yeast base
- Stage of Wine making: During yeast rehydration
- Impact: Supports healthy fermentations
- Storage: Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Recommended Dosage
- 30 g/hL 2.5 lb/1000 gal

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30 g/hL 2.5 lb/1000 gal

Note: This recommendation is based on a yeast inoculum of a medium ferment (5 g/l). If using more or less yeast, use a ratio of 1 part yeast to 1.25 parts of Go-Ferm Protect Evolution.

Impact: Supports healthy fermentations

Usage
Mix Go-Ferm Protect Evolution in 20 times its weight of clean 43°C (110°F) water. Let the mixture cool to 40°C (104°F) then add the selected active dried yeast. Let stand for 20 minutes. Slowly (over 5 minutes) add equal amounts of juice/must to be fermented to the yeast slurry. Do not allow more than 10°C (18°F) difference. Acclimatise yeast as necessary (see page 36 for more details).

Storage
Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Stage of Winemaking:
- Provides: Natural vitamins & minerals in autolyzed yeast base
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Storage
Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

Stage of Winemaking:
- Provides: Natural vitamins & minerals in autolyzed yeast base
- Stage of Wine making: During yeast rehydration
- Impact: Supports healthy fermentations
- Storage: Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

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Note: This recommendation is based on a yeast inoculum of a medium ferment (5 g/l). If using more or less yeast, use a ratio of 1 part yeast to 1.25 parts of Go-Ferm Protect Evolution.
**Yeast Nutrients**

**ESTERS OR THIOLS: WHICH STIMULA NUTRIENT SHOULD YOU USE?**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Description</th>
<th>Usage</th>
<th>Storage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STIMULA CHARDONNAY FOR ESTERS</strong></td>
<td>Esters contribute sweet-fruity aromas and flavors in white, rosé and red wines. It is the synergy of esters that contributes to overall complexity of wine aromas. Recent research has shown that ester production happens in two phases with the majority of esters produced during last two thirds of fermentation.</td>
<td><strong>Stage of winemaking:</strong> 1/3 sugar depletion if YAN needs cannot be achieved using Fermaid O or Fermaid K. <strong>Impact:</strong> Supports cell growth, drives fermentation rate.</td>
<td>Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.</td>
<td>Provides: Ammonia and phosphates Measurable YAN at 25 g/hL dose: 50 ppm YAN equivalents at 25 g/hL dose: 50 ppm <strong>Usage</strong></td>
</tr>
<tr>
<td><strong>STIMULA SAVIGNON BLANC FOR THIOLS</strong></td>
<td>Volatile thiols are compounds that contribute tropical notes reminiscent of passion fruit, guava and grapefruit in white wines. Although Sauvignon blanc is the poster child for thiols we know that volatile thiol precursors are in the skin of many other white varieties like Chardonnay, Colombard, Gewürztraminer, Grenache blanche, Pinot gris, Pinot blanc and Sémillon. Interestingly, the blackcurrant flavor found in red wines like Cabernet Sauvignon, Merlot and Syrah are also due to the presence of thiols. These compounds are released from their bound form due to yeast enzymatic activity, and yeast establish this enzymatic activity very early in fermentation. Using Stimula Sauvignon Blanc early in any thiolic varietal can help to optimize the potential of volatile thiol production.</td>
<td><strong>Stage of winemaking:</strong> During fermentation at 2-3°Brix sugar drop <strong>Impact:</strong> Optimizes uptake of thiol precursors</td>
<td>Dated expiration. Store in a dry environment at 18°C (65°F).</td>
<td>Provides: Organic nitrogen with natural vitamins and minerals Measurable YAN at 40 g/hL dose: 16 ppm YAN equivalents at 40 g/hL dose: 64-96 ppm <strong>Usage</strong></td>
</tr>
<tr>
<td><strong>DIAMMONIUM PHOSPHATE (DAP)</strong></td>
<td>Inorganic nitrogen source</td>
<td></td>
<td></td>
<td><strong>Stage of winemaking:</strong> 1/3 sugar depletion if YAN needs cannot be achieved using Fermaid O or Fermaid K. <strong>Impact:</strong> Supports cell growth, drives fermentation rate.</td>
</tr>
</tbody>
</table>
| **FERMAID K/FERMAID K (KOSHER)*** | Complex yeast nutrient | | | Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry. | | | |}

*Note: The ingredients in Fermaid K and Fermaid K (Kosher) are listed by the TTB as acceptable in good commercial winemaking practice in 27 CFR 24.246. For more information please visit www.ffa.gov. This product contains thiamine. The TTB Maximum Legal Dose for thiamine (hydrochloride) is 25 mg/L (0.0021 lb/1000 gal) of wine or juice at 18°C (65°F).*

---

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimula Sauvignon Blanc</td>
<td>40 g/hL</td>
<td>3.3 lb/1000 gal</td>
</tr>
<tr>
<td>Fermaid K (Kosher)</td>
<td>25-50 g/hL</td>
<td>2-4 lb/1000 gal</td>
</tr>
</tbody>
</table>

**NUTRIENTS FOR FERMENTATION SECURITY**

Yeast nutrition refers to the utilization of essential nutrients for cellular reactions which ultimately ensures the growth and survival of the cell. Fermentation nutrients are a vital part of a controlled fermentation strategy. Yeast cells use nitrogen for growth, enzyme synthesis, protein synthesis and sugar transport. Yeast cells also require a balanced supply of minerals (magnesium, zinc, etc.), vitamins, sterols including ergosterol and natural sterols from the grapes (phytosterols), polyunsaturated fatty acids, and oxygen.

Tailor your fermentation regime for optimal yeast reproduction, sugar transport and aromatic expression.

**DIAMMONIUM PHOSPHATE (DAP)**

- **Inorganic nitrogen source**
- **Stage of winemaking:** 1/3 sugar depletion if YAN needs cannot be achieved using Fermaid O or Fermaid K.
- **Impact:** Supports cell growth, drives fermentation rate.
- **Measurable YAN at 25 g/hL dose:** 50 ppm
- **YAN equivalents at 25 g/hL dose:** 50 ppm

**FERMAID K/FERMAID K (KOSHER)***

- **Complex yeast nutrient**
- **Stage of winemaking:** 1/3 sugar depletion if YAN needs cannot be achieved using Fermaid O or Fermaid K.
- **Impact:** Supports cell growth, drives fermentation rate.
- **Measurable YAN at 25 g/hL dose:** 50 ppm
- **YAN equivalents at 25 g/hL dose:** 50 ppm

---

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimula Sauvignon Blanc</td>
<td>40 g/hL</td>
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</tr>
<tr>
<td>Fermaid K (Kosher)</td>
<td>25-50 g/hL</td>
<td>2-4 lb/1000 gal</td>
</tr>
</tbody>
</table>
Fermaid O™ is a blend of highly specific inactivated yeast fractions that are rich in assimilable amino acids (organic nitrogen). It’s amino acid profile is highly consistent. Though Fermaid O does not supply a lot of Measurable YAN (see pg 43 for more info), it is a highly effective nutrient. It reliably lowers peak fermentation temperatures, produces lower levels of negative sulfur compounds, and improves fermentation kinetics. Organic nitrogen use has been correlated with positive aromatic expression (thiols and esters) and mouthfeel. For more info, see article on pg 48.

Fermaid O does not contain any DAP or supplemented micro-nutrients. For optimal results, Fermaid O should be used in conjunction with Go-Ferm Protect Evolution™ rehydration nutrient (pg 45).

Reskue® is a specific wine yeast that has been inactivated and treated with a specialized process to create cells with very high bioadsorptive properties specific for short- and medium-chain fatty acids. These fatty acids are toxic to yeast and can be created by yeast during stressful fermentation conditions. Their presence interferes with yeast membrane sugar transport proteins thereby interfering with sugar uptake rates. Using Reskue removes these toxins and reinvigorates sluggish or stuck alcoholic fermentation.

Reskue has unique lump and bump! This increased surface area allows for greater adsorption of toxins.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Dosage</th>
<th>10-40 g/hL</th>
<th>0.83-3.3 lb/1000 gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>Suspend Reskue in 10 times its weight of clean 30–37°C (86–98°F) water and mix. Wait 20 minutes then add to challenging fermentation. For stick fermentations, allow Reskue to settle for 48 hours then rack off and follow restart protocol (pg 38-40).</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.</td>
<td></td>
</tr>
</tbody>
</table>

**Impact:** Reinvigorates and detoxifies sluggish and stuck fermentations

**Stage of winemaking:** Any point during fermentation

**Usage**

Suspend Reskue in 10 times its weight of clean 30–37°C (86–98°F) water and mix. Wait 20 minutes then add to challenging fermentation. For stick fermentations, allow Reskue to settle for 48 hours then rack off and follow restart protocol (pg 38-40).

**Storage**

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Dosage</th>
<th>40 g/hL</th>
<th>3.3 lb/1000 gal</th>
</tr>
</thead>
</table>

**Nutrient Vit End™**

This specific inactivated yeast can be used at any stage of the fermentation process. Due to its bioadsorptive properties Nutrient Vit End™ can be used early to bind residual fungicides or later to bind specific fermentation derived inhibitors like short- and medium-chain fatty acids. When used pre-ventively, Nutrient Vit End can bind these toxins and help minimize the risk of sluggish or stuck fermentations.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Dosage</th>
<th>30–40 g/hL</th>
<th>2.5-3.3 lb/1000 gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>Suspend Nutrient Vit End in water or juice/must and mix well before adding.</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.</td>
<td></td>
</tr>
</tbody>
</table>

**Impact:** Binds fungicides and other fermentation inhibitors

**Stage of winemaking:** Any point during fermentation

**Storage**

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Dosage</th>
<th>2.5 kg</th>
<th>$92.00</th>
</tr>
</thead>
</table>

**Nutrient Vit End™**

This specific inactivated yeast can be used at any stage of the fermentation process. Due to its bioadsorptive properties Nutrient Vit End™ can be used early to bind residual fungicides or later to bind specific fermentation derived inhibitors like short- and medium-chain fatty acids. When used pre-ventively, Nutrient Vit End can bind these toxins and help minimize the risk of sluggish or stuck fermentations.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Dosage</th>
<th>2.5 kg</th>
<th>$75.00</th>
</tr>
</thead>
</table>

**Yeast derivative nutrients**

Yeast nutrient products are produced from specific strains of wine yeast that have been inactivated and then fully or partially autolyzed to provide enologically attractive compounds like polysaccharides and peptides. These compounds are harvested in their most reactive form. Each of our yeast derivative nutrients can be differentiated by: strain, level of refinement, functional contribution, and the presence of specific fractions such as glutathione. These winemaking tools contribute certain fermentative advantages and significant wine quality improvement.

**Aroma stability**

Glutathione and other peptides protect aromas due to their anti-oxidant and quinone-scavenging properties. Polysaccharides can bind with some aroma compounds leading to a stabilizing effect as well as a lengthening of aroma sensations.

**Color stability**

High molecular weight polysaccharides can interact positively with polyphenolic compounds. This complex can help stabilize polymeric pigments (color).

**Peptides**

Peptides act as anti-oxidants and quinone-scavengers, and give the perception of sweetness.

**Mouthfeel**

Aging on lees releases mannoproteins and polysaccharides that result in reduced astringency and an increase in mouthfeel components. When polysaccharides complex with tannins there are less reactive sites where the tannin can react with salivary proteins, thus lowering the perception of astringency.

**Glutathione**

Glutathione is a natural tripeptide found in grapes and yeast in two forms: reduced (GSH) and oxidized (GSSH). In winemaking, GSH is the active form that can scavenge ortho-quinones and can act as a buffer in redox reactions. This powerful antioxidant helps to protect juice and wine from the deleterious effects of oxygen.

**Polysaccharides**

The main sources of polysaccharides in wine are from grape skin walls or yeast. Yeast-based polysaccharides can improve aroma, color stability and mouthfeel. They can add palate weight, sweetness and decrease astringency depending on the molecular weight of the compound, its composition and structure.

**Selecting yeast derivative nutrients for success**

Yeast derivatives have been used for centuries, historically in the form of autolyzed lees. Lees aging enhances the complexity and stability of wines but the process is slow and can take years to complete. It also comes with risks of sulfur off-odor production, microbial spoilage, and unpredictable outcomes due to the variability of the yeast used for fermentation. Yeast derivative nutrients are autolyzed (inactivated) yeast that can contribute to balance, aroma preservation and color stability of wines but the process is slow and can take years to complete. It also comes with risks of sulfur off-odor production, microbial spoilage, and unpredictable outcomes due to the variability of the yeast used for fermentation. Yeast derivative nutrients are autolyzed (inactivated) yeast that can contribute to balance, aroma preservation and color stability of wines but the process is slow and can take years to complete.

**Note:** Due to high nutrient requirements, some yeast strains may benefit from additional yeast derivative nutrients listed in the preceding pages.
Glutastar™ is a yeast derivative nutrient that is used early in white and rosé winemaking to scavenge quinones. Quinones quickly lead to oxidative damage when left untreated. By scavenging quinones, aroma compounds and color are preserved. Glutastar is a highly soluble, unique, autolyzed yeast that engenders quinones, aroma compounds and color are preserved. Glutastar can be used in no- and low-SO₂ winemaking.

Glutastar is a highly soluble, unique, autolyzed yeast that is used early in winemaking to scavenge quinones. Quinones quickly lead to oxidative damage when left untreated. By scavenging quinones, aroma compounds and color are preserved. Glutastar can be used in no- and low-SO₂ winemaking.

**Usage**

Mix Glutastar in 10 times its weight of water or juice. Add directly to juice post-pressing for optimal protection. This product is mostly soluble. Stir to maintain suspension before and during addition.

**Storage**

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

**Recommended Dosage**

- **0.15 kg (30 g/hL)**
- **2.5 lb/1000 gal**

**Stage of winemaking:** Add directly to juice post-pressing. Provides Peptides, polysaccharides and glutathione. Impact: Scavenges quinones to protect aromas and color.

**YAN contribution:** insignificent.

**Fig. 2: Color Analysis in a 2018 Provence Rosé of Syrah/Grenache. Trial Compares Control Wine with Glutastar added after Pressing**

Glutastar™ is a partially autolyzed yeast derivative nutrient that gives the perception of sweetness and promotes harmony between mouthfeel characteristics in red, white and rosé wines. Upon addition, Noblesse™ starts to release polysaccharides that can help mask sensations of acidity, astringency or bitterness while helping to integrate alcohol and oak. Wines made using Glutastar appear to have more fruit and sweetness due to the contribution of low molecular weight polysaccharides. There is also a decrease in tannin intensity and a reduction in both drying and aggressive characters due to the softening effect of the high molecular weight polysaccharides. Noblesse can be used at any time during fermentation and although immediate results are possible, full integration may take three to five months.

**Usage**

Mix Noblesse in 10 times its weight of water or juice. Add during a pump-over or during tank mixings. This product is mostly soluble. Stir to maintain suspension before and during addition.

**Recommended Dosage**

- **0.15 kg (30 g/hL)**
- **2.5 lb/1000 gal**

**Stage of winemaking:** Anytime during fermentation processes. Provides: High and low molecular weight polysaccharides. Impact: Adds sweetness, harmonizes and integrates mouthfeel.

**YAN contribution:** insignificent.

**Fig. 1: Impact of Glutastar on Volatile Thiol Content in a Sauvignon blanc at End of Fermentation**

**GLUTASTAR MORE THAN GLUTATHIONE**

Glutathione protects color and aromas from oxidation during the earliest stages of post-harvest winemaking. Glutathione is a tripeptide naturally found in grapes and yeast in its reduced or oxidized form. In winemaking, only glutathione in its reduced form, GSH, protects musts and wines against oxidation due to its ability to scavenge ortho-quinones. GSH plays a critical role in preventing the oxidation of wine phenols via the reaction of its sulfhydryl group with cataric acid, one of the most browning-susceptible phenols in wine, to generate stable and colorless products. Other wine compounds contain sulfhydryl groups (some thiols, the amino acid cysteine, and the glutamyl-cysteine dipeptide) but only GSH can react with cataric acid. GSH can also outcompete several wine aromatic thiols such as 3MH, 3MHA and 4MMP, for oxidative ortho-quinones thus protecting these wine aromas.

Pure glutathione is not allowed to be added to must or wines but the early addition of Glutastar™, a new GSH-rich yeast derivative, provides a natural alternative to glutathione that is entirely natural. Glutastar was developed for the protection of white and rosé wines against oxidation phenomena responsible for color browning and loss of aromas. In fact, studies have shown Glutastar to be more effective than glutathione alone.

**Staff Pick**

Glutastar is my favorite new product for 2020. Merely explaining what this product does doesn’t do it justice. Yes, it’s an antioxidant and it protects aromas and colors, but it’s even more interesting than that. It reminds me of seeing a dress on a hanger and not realizing how cool it is until you try it on and then thinking “Damn! This is so nice.” Good. This product needs to be experienced to be appreciated.
**Opti-RED™** is an inactivated and partially autolyzed yeast derivative nutrient. Opti-RED may be used either at the beginning or towards the end of red wine fermentations. Using Opti-RED in the must quickly releases polysaccharides. These polysaccharides are then available to complex with polyphenols. This early complexing results in red wines with better color stability. Using Opti-RED in the latter part of alcoholic fermentation allows the winemaker to shape harsh polyphenolics into smoother, more approachable tannins.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>30 g/hL</th>
<th>2.5 lb/1000 gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15140</td>
<td>1 kg $84.00</td>
</tr>
<tr>
<td>#15136</td>
<td>2.5 kg $102.00</td>
</tr>
<tr>
<td>#15211</td>
<td>10 kg $295.00</td>
</tr>
</tbody>
</table>

**Usage**

Mix Opti-RED in 10 times its weight of must or water and add during a punch-down or a pump-over to ensure Opti-RED is mixed in well. This product is partially soluble. Stir to maintain suspension before and during addition.

**Storage**

Dated expiration. Store at 18°C (65°F). Once opened, keep tightly sealed and dry.

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**Opti-WHITE™** is prepared using a specific production process that results in a yeast derivative nutrient containing both antioxidative peptides and polysaccharides. The peptides protect aromatics, whereas the polysaccharides help stabilize aroma compounds and enhances roundness.

When added to the juice at the onset of fermentation Opti-WHITE helps to prevent oxidative browning* while bringing smoothness and complexity. When Opti-WHITE is added during the later stages of fermentation, it helps integrate the flavors.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>25–50 g/hL</th>
<th>2–4 lb/1000 gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>#15165</td>
<td>1 kg $84.00</td>
</tr>
<tr>
<td>#15186</td>
<td>2.5 kg $102.00</td>
</tr>
<tr>
<td>#15246</td>
<td>10 kg $295.00</td>
</tr>
</tbody>
</table>

*Use 50 g/hL for maximum antioxidative properties or use Glutastar™ (pg 51) for maximum anti-browning potential.

**Usage**

Mix Opti-WHITE in 10 times its weight of juice or water. Add to the juice after settling or directly to the barrel or tank prior to the onset of fermentation. If adding during the later stages of alcoholic fermentation, add during a tank mixing for proper homogenization. This product is partially soluble. Stir to maintain suspension before and during addition.

**Storage**

Dated expiration. Store in a cool and dry environment at 18°C (65°F). Once opened, keep tightly sealed and dry.

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**FREQUENTLY ASKED QUESTIONS: YEAST NUTRIENTS**

**What is the difference between Go-Ferm and Go-Ferm Protect Evolution?**

Go-Ferm Protect Evolution is the latest generation of rehydration nutrients, developed in conjunction with INRA, France, for today’s winemaking needs. In addition to the vitamins and minerals that Go-Ferm provides Go-Ferm Protect Evolution contains higher levels of un satu rated fatty acids and steroids for improved sugar uptake capacity and fermentation security.

**Why don’t my Go-Ferm and Go-Ferm Protect Evolution go into solution?**

This is a good thing! Due to their high content of sterols and fatty acids, they will not go completely into solution.

**Can I use Fermaid K in my yeast rehydration water instead of Go-Ferm?**

No, using nutrients that contain ammonia salts during the rehydration phase can be toxic to the yeast. Rehydration nutrients should be fully autolysed so that the nutrients are freely available to the yeast.

**Every harvest I add 2 lb/1000 gal of a complete yeast nutrient 1/3 of the way through fermentation. Is that what is recommended?**

A 2 lb/1000 gal addition at 1/3 of the way through fermentation may suffice, however, this depends on the specific conditions of each fermentation. To help build a nutrient supplementation program, see the planner on pg 44.

**I missed the addition of nutrients at 1/3 sugar depletion. Should I add Fermaid O or Nutrient Vit End?**

This really is a case-by-case scenario. Some suppliers say their nutrients contain a lot more nitrogen than Fermaid O. Why? Other suppliers may be calculating total nitrogen versus the nitrogen that can be utilized by the yeast (YAN). Not all nitrogen is assimilable by yeast and not all nitrogen is utilized equally. Nitrogen supplied as amino acids from autolyzed yeast are very efficiently used. Research shows that YAN from amino acids can be four times more efficient than YAN from ammonia (DAP) (see article “Fermaid O is More Efficient than Ammonia” on pg 43). That means that an addition of 40 g/hL of Fermaid O can be calculated as having a yeast assimilable nitrogen equivalent value of 64 ppm. A 40 g/hL addition of ammonia as a comparison gives 80 ppm yeast assimilable nitrogen, but this is used up very quickly leading to a deficiency.

**I checked my YAN and added DAP accordingly. Why do I still have off- aromas and/or stuck fermentations?**

Both inorganic (ammonia) and organic (amino acids and peptides) nitrogen occur naturally in grape must. Each type of nitrogen has a distinct role and impact on fermentation. While yeast may show an affinity for inorganic nitrogen, adding only ammonia (in the form of DAP) is not what is best for the yeast. A diet balanced with organic nitrogen, vitamins and minerals can produce healthier fermentations, better aromatics and lower levels of undesirable compounds.

**I am noticing sulfur off-odors during fermentation — what should I do?**

First, assess your nutrient program. If it is early enough in the fermentation, consider increasing your nutrient additions. Organic nutrients such as Fermaid O can go a long way in improving aromatics. If you are past the point where additional complex nutrients are recommended, run a bench trial with Noblesse and Reduces. If this is a continual problem, consider using our low- to no-H₂S strains.

**As fermentation progresses, I have noticed an increased perception of ‘hotness’ on the finish of my wines. Are there any products that can help with this?**

Try an addition of Opti-MUM Red, Opti-WHITE or Noblesse. My whites and rosés tend to lose their aromatic freshness quickly. What can I do to preserve the aromatics? Inactivated yeast derivative products like Glutastar can help retain aromatic intensity and longevity.

**Why don’t some nutrients increase YAN?**

All yeast derived nutrients will have some nitrogen to contribute to a fermentation, but different autolyzed yeast products are used for different reasons. The YAN contribution is only mentioned if the goal of the product is nitrogen supplementation and fermentation security.
Malolactic fermentation (MLF) converts malic acid to lactic acid and has a direct impact on wine quality. Uncontrolled, spontaneous malolactic fermentations or wild lactic acid bacteria can result in diminished varietal and fruit flavors, reduced esters, masked aromas and off-characters. The importance of choosing a selected malolactic (ML) strain has increased due to evolving winemaking preferences (e.g. higher pH levels, lower SO2, higher alcohol, etc.), as well as concerns such as biogenic amines. The use of selected malolactic strains can contribute positively to wines while minimizing risks.

**SELECTING BACTERIA FOR SUCCESS**

It is very important to know the properties of the wine prior to inoculating with malolactic bacteria. Analyze the wine for pH, SO2, volatile acidity (VA), residual sugar, malic acid and alcohol level. Extremes in one or more of these properties can have a compounding inhibitory effect on the growth of malolactic bacteria. For example, if a wine has low pH and high SO2, that will be more antagonistic to the bacteria than low pH alone. Creating an optimal environment for malolactic bacteria includes:

**TEMPERATURE**

- **Optimal:** 20–25°C (68–77°F)
- **Challenging:** <60°F or >85°F

**ALCOHOL LEVEL**

- **Optimal:** <13% (v/v)
- **Challenging:** >16% (v/v)

**pH**

- **Optimal:** >3.5
- **Challenging:** <3.5

**SO2**

- **Optimal:** free SO2 <10 ppm, total SO2 <45 ppm, molecular SO2 <0.3 ppm
- **Challenging:** free SO2 >10 ppm, total SO2 >60 ppm, molecular SO2 >0.3 ppm

**NUTRITIONAL STATUS**

Malolactic bacteria require sugar (fructose, glucose), organic acids (malic, citric, pyruvic), organic nitrogen (amino acids, peptides), vitamins (B group, pantothenic acid) and trace minerals (Mn, Mg, K, Na). Good nutrition is important for malolactic bacteria and nutrients such as Opti’Malo Blanc and ML Red Boost will help with the growth and survival of specific malolactic bacteria. Malolactic nutrients are not as critical in a co-inoculation.

**STRAIN COMPATIBILITY**

Choose a yeast strain which is compatible with the selected malolactic bacteria. See MLF Compatibility in the yeast charts on pages 11–14.

**MALIC AND LACTIC ACID**

Measure malic acid levels. Wine conditions are difficult for bacteria if the malic level is <0.5 g/L or >7.0 g/L. The higher the malic acid levels the higher the resulting lactic acid levels which can be stressful for bacteria. Lactic acid levels of 1.5 g/L slow down bacteria and 3 g/L starts to inhibit MLF.

**CHEOING ML BACTERIA AND NUTRIENTS**

<table>
<thead>
<tr>
<th><strong>ML Bacteria</strong></th>
<th>MLR Red Boost</th>
<th>Acti-ML</th>
<th>Opti’Malo Blanc</th>
<th>Opti’Malo Plus</th>
<th>ML Red Boost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alcohol tolerance (%) v/v</strong></td>
<td>&lt;15.0</td>
<td>&lt;15.5%</td>
<td>&lt;15.0</td>
<td>&lt;14.0</td>
<td>&lt;14.0</td>
</tr>
<tr>
<td><strong>pH limit</strong></td>
<td>&gt;3.2</td>
<td>&lt;3.2</td>
<td>&lt;3.2</td>
<td>&lt;3.1</td>
<td>&lt;3.1</td>
</tr>
<tr>
<td><strong>Total SO2 limit (mg/L)</strong></td>
<td>&lt;60</td>
<td>&lt;50</td>
<td>&lt;60</td>
<td>&lt;45</td>
<td>&lt;60</td>
</tr>
<tr>
<td><strong>Temperature °C (°F)</strong></td>
<td>&gt;14° (57°)</td>
<td>&gt;14° (57°)</td>
<td>&gt;14° (57°)</td>
<td>&gt;18° (64°)</td>
<td>&gt;13° (55°)</td>
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<tr>
<td><strong>Relative nutrient demand</strong></td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Typical fermentation kinetics</strong></td>
<td>Start</td>
<td>Fast</td>
<td>Slow</td>
<td>Fast</td>
<td>Mod</td>
</tr>
<tr>
<td><strong>Reds</strong></td>
<td>Whines and Rose</td>
<td>Fruit, Cider and Mead</td>
<td>Compatible with yeast co-inoculation</td>
<td>Higher diacetyl production</td>
<td>Enhances mouthfeel and fullness</td>
</tr>
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<td><strong>Whites and Rosé</strong></td>
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<tr>
<td><strong>Enhances structure</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Enhances fruitiness and/or spiciness</strong></td>
<td></td>
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<tr>
<td><strong>Restart stuck or sluggish MLF</strong></td>
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<tr>
<td><strong>Bacteria rehydration nutrient</strong></td>
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<tr>
<td><strong>Nutrient for difficult red MLFs</strong></td>
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<tr>
<td><strong>Nutrient for difficult white MLFs</strong></td>
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<tr>
<td><strong>General ML Nutrient</strong></td>
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<tr>
<td><strong>OMRI Listed</strong></td>
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</tr>
</tbody>
</table>

*When inoculated in sequential order with yeast"
DIRECT ADDITION BACTERIA

Wine environments are hostile. To compensate, Lallemand developed the MBR™ process which prepares the bacterial cell membranes for difficult conditions. The MBR process allows for the direct inoculation of the bacteria into the wine without any refrigeration. Note of our commercial ML strains contain the deacetylase enzymes known to produce biogenic amine. They are also cinnamyl esterase negative meaning they can't produce the precursors for ethyl phenol production by Brettanomyces.

CO-INOCULATION

Malolactic bacteria can be added early in primary fermentation, known as co-inoculation, or toward the end of primary fermentation, known as sequential inoculation (see SEQUENTIAL INOCULATION below). Adding bacteria in co-inoculation, or within 24–48 hours of yeast, can have many benefits. Due to the temperature development of primary fermentation, lack of alcohol, and better nutrient availability, malolactic bacteria growth conditions are more favorable and MLF can finish shortly after primary fermentation. Another benefit is the effect on flavor. Because of the reductive environment of the alcoholic fermentation, very little diacetyl (butter) aroma or flavor is produced. The resulting wines are fresh and fruity.

BETA CO-INOC™ was specifically selected by Lallemand for reliable performance in co-inoculation of wines with pH >3.2. Not recommended for use in a sequential MLF. Wines that are co-inoculated have a more fruit-forward profile due to diacetyl consumption by yeast and bacteria. Beta Co-Inoc is added to the juice/must 24–48 hours after yeast inoculation and mix thoroughly.

Usage
Add directly to juice 24–48 hours after yeast inoculation and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Elisio Beta™ was isolated in the Abruzzi wine region of Italy. Its name comes from its capacity to increase levels of beta-sitosterol and beta-ionone which are compounds that contribute floral notes, particularly in Merlot. Beta contributes fruity and berry notes in Cabernet Sauvignon and can enhance diacetyl in white wines when used in a sequential fermentation. Beta benefits from the addition of a malolactic nutrient.

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Note: In co-inoculation, the health and success of the primary fermentation are keys to success. Factors such as pH, redox temperature, and temperature must be considered. If the primary fermentation is sluggish or stuck, it may be necessary to add Bactiless™ (pg 90), or Lysovin (pg 89). This is especially important if the pH is over 3.5. Beta Co-Inoc is not recommended for wines with alcohol potential >15% (v/v).

Elisio 1™ was isolated by the Institut Coopératif du Vin Français de la Vigne et du Vin (IFV) in Burgundy for its activity on malolactic fermentation, very little diacetyl (butter) aroma or flavor is produced. The resulting wines are fresh and fruity.

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Alcohol Tolerance: <14% pH: >3.4 Total SO₂: <60ppm Temp: >57°F

Elisio 1™ was isolated by the Institut Coopératif du Vin (ICV) from a spontaneous malolactic fermentation for use in warm region red wines with high pH.

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Alcohol Tolerance: <14% pH: >3.4 Total SO₂: <60ppm Temp: >57°F

SEQUENTIAL INOCULATION

Many winemakers prefer to add malolactic bacteria toward the end of primary fermentation. This is known as sequential inoculation. In wines with pH >3.5, residual sugar can be consumed by malolactic bacteria to form volatile acidity (VA). When malolactic fermentation is conducted after primary fermentation the risk of VA is minimized. Wines made by sequential inoculation can also have higher levels of diacetyl when using certain bacteria strains (see article on “UsingTiming of Inoculation to Influence Diacetyl Levels and Drive Wine Style” on page 63 for more information).

It is often described as enhancing mouthfeel and complexity while reducing perceptions of green and vegetative characters.

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Alcohol Tolerance: <15.5% pH: >3.2 Total SO₂: <50ppm Temp: >5°F

MBR 31™ was selected by the IFV for use in red and white wines. Known for its positive sensory characteristics. In reds, it may increase berry fruit flavors and mouthfeel. In whites, it is known for light buttery flavor, respect for fruit, increased body and length of finish. It is sometimes slow to start, but finishes quickly. It performs well even under stressful conditions such as low pH (3.1) and low temperature, though not below 1.5°C (55°F).

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Elisio O-MEGA™ was selected in the south of France by the Institut Français de la Vigne et du Vin (IFV) for its ability to enhance polyphenolic content and fruit character.

Usage
Add directly to wine and mix thoroughly.

Storage
Dated expiration. For short term (<18 months) store at 4°C (40°F). For long term (>18 months) store at -18°C (0°F).

Alcohol Tolerance: <16% pH: >3.4 Total SO₂: <45ppm Temp: >5°F

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Alcohol Tolerance: <14% pH: >3.4 Total SO₂: <60ppm Temp: >5°F
**PN4™** was isolated from a spontaneous malolactic fermentation in a Pinot noir by the Institute of San Michele in the Trentino region of Italy and is known for its fast fermentation kinetics. For Chardonnay, PN 4 is one of the highest diacetyl producers and selected by the Australian Wine Research Institute for its good fermentation rates and efficient fermentation kinetics, even in challenging conditions. Solo Select is known to enhance dark fruit and spicy notes while enhancing structure and complexity. The production of diacetyl and volatile acidity is low due to the late degradation of citric acid. This strain has a moderate nutrient demand and will benefit from ML Red Boost nutrient (pg 60). Fast and steady kinetics.

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**Usage**
Add directly to wine and mix thoroughly.

**Storage**
Dated expiration. For short term (<18 months) store at 4°C(40°F). For long term (>18 months) store at –18°C(0°F).
Opti’Malo Blanc™ is a unique malolactic nutrient specifically formulated for white and rosé wines from a blend of selected inactivated yeasts. Opti’Malo Blanc helps compensate for amino nitrogen and peptide deficiencies. The bioavailability of certain peptides stimulates the growth of selected bacteria and shortens the duration of MLF, especially under difficult white winemaking conditions.

**Recommended Dosage**

<table>
<thead>
<tr>
<th>Usage</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 g/hL</td>
<td>50 g/60 gal</td>
</tr>
<tr>
<td>1.7 lb/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Usage**

Suspend in small amount of water or wine and then add directly to the wine just before adding the malolactic bacteria. Opti’Malo Blanc should not be added to ML rehydration water (if rehydrating ML).

**Storage**

Dated expiration. Store at 18°C (65°F). Once opened, keep tightly sealed and dry.

**OPTI’MALO PLUS**

Complete malolactic nutrient

Reds, White and Rosés

#15141

1 kg

$55.00

Opti’Malo Plus™ is a general-purpose MLF nutrient. It is a blend of inactive yeasts rich in amino acids, mineral cofactors, vitamins, cell wall poly saccharides and cellulose. The celllose provides surface area to keep the bacteria in suspension and to help adsorb toxic compounds that may be present at the end of primary fermentation.

ML Red Boost™ (pg 60) is the preferred ML nutrient over Opti’Malo Plus for red wines and Opti’Malo Blanc (this page) is preferred for white and rosé wines.

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Dated expiration. Store at 18°C (65°F). Once opened, keep tightly sealed and dry.

**TROUBLESHOOTING GUIDE FOR MALOLECTIC FERMENTATIONS**

There are many factors that can influence the success of a malolactic fermentation (MLF). Before jumping into a full restart, it's a good idea to assess each of these factors. Sometimes only a small adjustment is needed to help a MLF complete successfully. If MLF continues to struggle after considering the factors listed below, a full MLF restart may be necessary. Our MLF restart protocol is available on the next page.

**WINE TEMPERATURE MIGHT BE TOO LOW**

Try warming the tank or barrels; 18-20°C (64-68°F) is optimal. A MLF will progress much slower at cooler temperatures.

**WINE MIGHT BE LACKING NUTRIENTS**

Try adding an ML-specific nutrient like ML Red Boost™ or Opti’Malo Blanc™ (pages 60 and 61, respectively).

**WINE MIGHT NEED A DETOX**

If you’ve already done a nutrient addition, the bacteria should have what it needs. Sometimes toxins can be present that impede the success of an MLF. Reskue™, a specific inactivated yeast for treating stuck fermentations, can be extremely beneficial for detoxification. Reskue should be added and racking after 14 hours (dosage and usage information on page 49).

**WINE CHEMISTRY MIGHT BE CHALLENGING OR INHIBITORY TO THE BACTERIA**

It is essential that you check your pH, alcohol, and free and total SO₂ to see if one of these factors might be inhibiting the fermentation. Winemakers are often surprised by the amount of SO₂ in a wine when they've added little to no SO₂. SO₂ can come from several sources including: yeast during alcoholic fermentation, vineyards, old barrels, or erroneous cellar additions. Total SO₂ is just as important to check. SO₂ is often bound to acetaldehyde and when bacteria consume acetaldehyde, free SO₂ is liberated which can inhibit MLF. If wine chemistry is challenging, make sure you’ve inoculated with a strain that can handle the challenges.

**THERE MAY NOT BE ENOUGH HEALTHY OENOCOCCUS OENI TO GET THE JOB DONE**

If you did not inoculate with Oenococcus oeni, there may not be enough healthy bacteria to complete MLF. Consider inoculating with a known strain that is appropriately suited to handle the chemistry of your wine. If you’ve already inoculated and the wine has low turbidity, it’s possible that the bacteria are struggling to stay in suspension. Try stirring your tanks or barrels more frequently.

**YOU MIGHT JUST NEED TO GIVE IT MORE TIME**

MLF can be a test of patience taking weeks, or even months, to complete. To determine if MLF is complete, malic acid must be measured — it’s nearly impossible to determine completion by sensory analysis — and is considered complete when malic acid is ≤0.1g/L (some say ≤0.2 g/L). If initial malic acid content was high (>7.0 g/L) then lactic acid produced by MLF may be high. Lactic acid levels >3g/L can inhibit MLF bacteria.

**HOW TO: RECOMMENDED METHOD TO RESTART A STUCK MALOLECTIC FERMENTATION**

**PREPARE THE STUCK WINE**

1. Add 30 g/L (2.5 lb/1000 gal) of Reskue™ prior to restart- ing. Suspend Reskue in 10 times its weight of warm water 30–37°C (86–98°F) (see pg 49 for more about Reskue). Wait 20 minutes then add to stuck wine.
2. Allow tank to settle for 48 hours then rack off the settled lees.
3. Adjust temperature of Reskue-treated wine to 18–22°C (64–72°F).

**MALOLECTIC ACTIVATOR ADDITION**

4. Add 20 g/L (1.7 lb/1000 gal) of ML Red Boost™ to Reskue-treated wine. When restarting a stuck MLF, ML Red Boost is used for white, red, and rosé wines.
5. Mix gently and wait 24 hours before bacteria addition.

**MALOLECTIC BACTERIA ADDITION**

6. Add a double dose of Lalvin MBR VP41™ direct inoculation culture (Example: for 1000 gallons, add 3 x 25L (660 gal) packets).
7. Check for MLF activity by analyzing L-malic acid degradation every 2-4 days.
USING TIMING OF INOCULATION TO INFLUENCE DIACETYL LEVELS AND DRIVE WINE STYLE

Malolactic fermentation is more than a simple conversion of malic acid to lactic acid. The ability of the malolactic bacteria, Oenococcus oeni, to affect wines in a positive way, both texturally and sensorially, is now being used to influence wine aromas and drive wine style. Common terms used to describe the positive effect of MLF on wine flavor are fruity, spicy, toasty, nutty and buttery. The butter aroma is due to diacetyl, an intermediate metabolite in the metabolism of citric acid (see Figure 1). High diacetyl concentrations in wine can be perceived as overly ‘buttery’ and may be regarded as undesirable by consumers. Lower diacetyl concentrations, depending on wine type and style, can contribute a desirable ‘buttery’ or butterscotch flavor character.

The timing of inoculation has a strong impact on diacetyl levels. In citric acid metabolism, pyruvic acid is decarboxylated to α-acetolactate intermediate (see figure 1). α-acetolactate is converted to diacetyl and then to β-diketone, acetolactate. Diacetyl is chemically unstable and can be reduced further by active O. oeni and yeast to less flavor-active products (acetoin and 2,3-butanediol). When ML bacteria is added 24-48 hours after yeast inoculation and alcoholic and malolactic fermentations occur together (co-inoculation), diacetyl is converted to the less bitter compounds resulting in fruitier wines.

Using a co-inoculation strategy in white wine or red wines is a powerful tool to enhance fresh, fruit-driven styles and to avoid the production of diacetyl, even with bacteria known for high diacetyl production (see Figures 2 and 3). If high diacetyl concentrations are desired, a sequential inoculation of O. oeni after alcoholic fermentation will promote the retention of diacetyl. The potential of diacetyl production is strain dependent (see Figure 2). For protocols to increase or decrease diacetyl go to www.scottlab.com.

Diacetyl is chemically unstable and can be reduced further by active O. oeni and yeast to less flavor-active products (acetoin and 2,3-butanediol). When ML bacteria is added 24-48 hours after yeast inoculation and alcoholic and malolactic fermentations occur together (co-inoculation), diacetyl is converted to the less bitter compounds resulting in fruitier wines.

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Using a co-inoculation strategy in white wine or red wines is a powerful tool to enhance fresh, fruit-driven styles and to avoid the production of diacetyl, even with bacteria known for high diacetyl production (see Figures 2 and 3). If high diacetyl concentrations are desired, a sequential inoculation of O. oeni after alcoholic fermentation will promote the retention of diacetyl. The potential of diacetyl production is strain dependent (see Figure 2). For protocols to increase or decrease diacetyl go to www.scottlab.com.
FREQUENTLY ASKED QUESTIONS: MALOLACTIC BACTERIA & ML NUTRIENTS

Can I use half a sachet of bacteria now and save the other half to use later?
No. Once the sachet of bacteria is opened it must be used immediately. Exposure to oxygen and excess moisture can be detrimental to the survival of the bacteria.

My bacteria arrived and the ice pack has melted. How can I be confident that my malolactic culture is in good shape?
We ship bacteria overnight with ice packs. If, despite our best efforts, the ice pack has melted and the container is not cold to the touch when your bacteria arrive, do not be alarmed. Lallemand’s proprietary manufacturing process means its bacteria is stable. Sealed packets can be delivered and stored for a few weeks at ambient temperature (~25°C/77°F) without significant loss of viability. Place the bacteria in the freezer (~18°C/0°F is preferred but up to 4°C/40°F is acceptable) and store until you need it.

I would like to have less diacetyl in my white wines. Which strain should I choose?
High inoculation levels of neutral strains like O-MEGAZ^TM and Lalvin MRB VP4™, will help control excessive diacetyl production. Co-inoculate by adding bacteria one day after yeast addition (if the pH is under 3.5). The diacetyl will be consumed by the yeast and bacteria. Leaking wine on the lees will also reduce diacetyl levels, as does conducting the MLF at warmer temperatures (24°C/72°F compared to 17°C/63°F). See article on page 63 for more information.

Can I use citric acid to acidulate my wine for increased diacetyl formation?
We do not recommend that you use citric acid for acidification as it cannot replace the yeast’s role in fermenting sugars to alcohol. Try increasing the yeast nutrient concentration when choosing a strain (see page 56 for more information).

Why does the total SO2 need to be measured when choosing the correct strain of bacteria?
SO2 can be bound to acetaldehyde. Bacteria can break that bond, increasing free SO2, making the wine environment more challenging for MLF.

I have tried everything to get my wine through MLF but nothing is working. What should I do?
Sometimes MLF might not be possible in certain wines. However, before giving up, consult the “Troubleshooting Guide for Malolactic Fermentations” on page 61 for more information. See article on page 63 for more information.

Why is my malolactic fermentation not finishing?
Check wine parameters (free and total SO2, pH, VA, and alcohol) and temperature to determine if there is an obvious reason that the fermentation is not completing. Pesticide and fungicide residue, juice concentrates and preservatives in the juice or wine can also inhibit malolactic bacteria, as can lack of essential nutrients. See “Troubleshooting Guide for Malolactic Fermentations” on page 61 for more information.

How is my MLF complete?
There is some controversy among wine scientists and professionals regarding this topic. At Scott Laboratories we think that MLF is complete when malic acid is <0.1 g/L. Others say that MLF is complete when malic acid is <0.2 g/L. See “Troubleshooting Guide for Malolactic Fermentations” on page 61 for more information.

Does the yeast strain used for primary fermentation affect the malolactic fermentation?
Yes. Some yeast strains are harder for malolactic fermentation than others. Yeast strains differ in nutrient demand, production of SO2, and rate of autolysis which has a resulting effect on the bacteria. Please refer to the yeast charts on pages 11-14 for their MLF compatibility ratings.

Does my bacteria need nutrients?
Unfortunately, there are no analytical tools to determine nutrient deficiencies for bacteria. Bacteria need amino acids (not ammonium salts), peptides, vitamins and minerals to complete a successful MLF. Each strain of bacteria, like yeast, has specific requirements. See “Choosing ML Bacteria and Nutrient Chart” on page 56 and “Troubleshooting Guide for Malolactic Fermentations” on page 61 for more information.

How do I choose the correct strain of bacteria for my wine?
Each bacteria strain performs best within specific environmental parameters. Consider free and total SO2 levels, pH, alcohol, and temperature constraints as well as malic acid concentration when choosing a strain (see page 56 for more information).

WINE STYLE GUIDE: CHARDONNAY

Chardonnay is the most popular white wine produced. Visit any wine region in the world, and there is at least one vineyard growing this grape. The wine can be simple or complex, aged for many years or consumed immediately. Chardonnay originally came to popularity in the Burgundy region of France, where it became known for its elegance and complexity. Other regions planted the variety as growers soon realized that the grape was relatively easy to grow, and winemakers could use a range of different wine-making techniques. Chardonnay is truly a grape that can be made into wines of many different styles. Chardonnay produced in relatively hot growing regions, such as the interior valleys of California, South Africa and Australia, can produce wines with tropical fruit flavors and even some suggestions of oakiness. In cooler wine regions, such as Chablis, Carneros and Tasmania, wines can be apple-crisp juice with razor sharp acidity. The best of which can benefit from five or more years in bottle to soften that acidity and develop rounder flavors for balance.

There are a number of protocols winemakers can use to create the Chardonnay style that fits their winery’s portfolio and their consumer’s preference best. For any particular style, factors to take into consideration are: turbidity (NTU), yeast strain, fermentation temperatures, additions of inactivated yeasts, nutrient regimes and malolactic fermentation choices. Below are some recommendations for achieving a desired Chardonnay profile.

**SO2 (PRESERVATIVE) USAGE**

- **Adding SO2 to the grape juice:**
  - 50 mg/L (pg 32) or Lalvin CY3079™
  - 100 mg/L (pg 32)

- **SO2 additions during MLF:**
  - Go-Ferm Protect Evolution™ at 30 g/hL (2.5 lb/1000 gal) (pg 45)
  - Lalvin QA23™ at 40 g/hL (3.3 lb/1000 gal) (pg 47)
  - Lalvin CY3079™ (pg 32) or Exotics Novello (pg 21)
  - Lalvin OY113™ (pg 22) or Lalvin CY047™ (pg 22)

- **FERMENTATION TEMPERATURE**

  - 15°C-18°C (59°F-64°F) (pg 58)
  - 20°C-25°C (68°F-77°F)

- **JUICE ADDITIONS**

  - Glutastar™ at 30 g/hL (1 lb/1000 gal) (pg 55)

- **NUTRIENT ADDITION**

  - 25 g/hL (2 lb/1000 gal)

- **Nutrient addition at 23°C (73°F)**

  - If YAN > 150 ppm then:
    - 10 g/hL DAP* (pg 48)
  - 10 g/hL DAP* (pg 48)
  - 40 g/hL (1.67 - 3.3 lb/1000 gal) (pg 46)
  - Formula Sauvignon Blanc** (pg 47)
  - Formula Sauvignon Blanc** (pg 47)

  - If YAN < 150 ppm then:
    - Formula D (pg 44)
    - Formula D (pg 44)
    - Formula D (pg 44)
    - Formula D (pg 44)

- **ML STRAIN CHECK**

  - Enoferm Beta™ (pg 30)
  - Beta-Coco™ (pg 57)

- **Acid Addition**

  * - Add until pH is 3.3-3.5 or until MLF has started.
  ** - Acid additions are recommended. Add 20 g/hL of ML Red Boost™ (pg 60) for structured red wines or 20 g/hL OptiML Blanc™ (pg 62) for white wines.
**OAK AND TANNINS**

Scott Laboratories offers a variety of tannins and oak infusion products to provide winemakers flexible tools to achieve wine-style goals. Sources of tannin include oak (American, European, toasted, untoasted), grapes (skin and seeds), chestnut, gall nuts and exotic woods. Each of these tannins have distinct functions and all provide some degree of protection from oxidation. We also offer oak chips and oak infusion products with multiple toast profiles to boost oak aroma and flavors, structure, and color. Our proprietary Thermic range of oak infusion products from the Oak Lab™ positively impacts weight, length, and complexity of wine. Whether oak infusion or tannin products, Scott Laboratories has a broad portfolio to assist in improving wine quality.

### SELECTING OAK & TANNINS FOR SUCCESS

The goal of using oak and tannins is to bring out the best that grapes have to offer from the moment they enter the winery. Oak and tannins can be used in all aspects of winemaking and their selection is determined by the state of the grapes, juice or wine, the grape variety, and the intended wine style. Tannins and oak can affect structure, aroma, provide protection against oxidation and promote color stability. They can also be used to mask greenness and enhance fruit characters. Use of oak and tannins in aging and finishing are especially useful in wines that may lack structure, complexity and balance.

### STABILITY

Fermentation tannins, which are generally a mix of condensed and ellagittannins, combine with the anthocyanins to create optimal color stability. In protein-rich grape varieties, some of the gall nut derived tannins can help remove proteins. Tannins help protect juice from browning, especially in grapes affected by Botrytis and other rot. They act as an antioxidant and inhibit laccase.

### STRUCTURE AND BALANCE

Untoasted oak chips added during fermentation can reinforce the structure of the juice, bringing length and perceived sweetness to the finished wine. Toasted oak chips can minimize the impact of astringency due to underripe fruit. Likewise, fermentation tannins added early can help mask greenness and build structure in a wine that is lacking in tannin. Oak infusion products and finishing tannins can be used during cellaring and aging, or as last-minute wine additions to bring balance, complexity and structure.

### AROMA

The use of tannins and oak can positively impact aromas in almost all stages of winemaking. Tannins can reveal and enhance aromas and mask some undesired green/herbaceous characters. The addition of oak infusions can affect the ripe fruit profiles, and integrate wood and oak characters to balance the aromatic profile of the wine.

### CHOOSING OAK AND TANNINS

<table>
<thead>
<tr>
<th>Tannins</th>
<th>Oak</th>
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<td><em>Highly Recommended</em></td>
<td><em>Recommended</em></td>
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<td>Whites and Rosé</td>
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<td>Fruit, Cider and Mead</td>
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<td>Protection from oxidation for white wine</td>
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<td>Mouthfeel enhancement for white wine</td>
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<td>Grape tannin</td>
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<td>Enhances structure</td>
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<td>Enhances mid-palate volume</td>
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<td>Enhances aromatic potential</td>
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<td>Stabilizes color</td>
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<td>Enhances fruit</td>
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<td>Mitigates green, swampy characters</td>
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<td>Vanilla oak character</td>
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<td>Protects grapes with rot</td>
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<td>Enhances aging potential</td>
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<td>Perception of sweetness</td>
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<td>Lowers perception of alcohol</td>
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<td>Rapid integration</td>
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<td>Used during fermentation</td>
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<td>Used during aging</td>
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<td>Used for finishing</td>
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**TANNINS**

A winemaker’s goal is to showcase the grapes. This begins the moment the fruit enters the winery and continues until the wine is bottled. Tannins can be used to enhance aromas, mouthfeel, stabilize color and add structure.  

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**ESTATE**  
Mid-palate volume enhancement during aging  
White, Rosé, Red

- **Dosage**
  - Prior to Barreling: Red Wine: 50–300 ppm 5–30 g/hL 0.42–2.5 lb/1000 gal
  - Prior to Bottling (3–6 weeks) or During Racking: 50–100 ppm 5–10 g/hL 0.42–0.83 lb/1000 gal

**Usage**
During transfer or racking add Estate into the wine. Mix well for homogeneity. Subsequent additions should be made 6 weeks before bottling. Additions should be made at least 6 weeks before bottling to allow for polymerization and settling.

**Storage**
Dated expiration. Unopened, the shelf-life is 5 years at 18°C (65°F). Once opened, keep tightly sealed and dry.

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**FT BLANC SOFT**  
Protection from oxidation  
White, Rosé, Cider, Mead

- **Dosage**
  - White/Rosé Juice: 50–150 ppm 5–15 g/hL 0.42–1.2 lb/1000 gal
  - Red Wine: 50–500 ppm 5–50 g/hL 0.42–2.5 lb/1000 gal

**Usage**
Add FT Blanc Soft by sprinkling directly on grapes at the crusher, adding to juice, or adding to wine during a tank mixing. Good homogenization is important. If an addition is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

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**FT BLANC CITRUS**  
Enhances fruity and floral aromas  
White, Rosé, Cider

- **Dosage**
  - White/Rosé Juice: 50–150 ppm 5–15 g/hL 0.42–1.2 lb/1000 gal
  - Red Wine: 50–500 ppm 5–50 g/hL 0.42–2.5 lb/1000 gal

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**FT COLORMAX**  
Promote color stability  
Red, Fruit

- **Dosage**
  - Red Must: 100–300 ppm 10–30 g/hL 0.8–2.5 lb/1000 gal

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Scott’Tan™ Estate can help compensate for lack of tannins in finished wine without the “dryness” associated with barrels. It enhances mid-palate, complexity and balance while providing a measure of antioxidant protection. Fruit characters can be enhanced. Estate is especially recommended when using older, tannin-depleted barrels.

Add FT Blanc by sprinkling directly on grapes at the crusher, adding to juice, or adding to wine during a tank mixing. Good homogenization is important. If an addition is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.
Scott’Tan™ FT Rouge is a proprietary tannin which is a blend of highly reactive tannins derived from exotic woods and chestnut. The addition of FT Rouge at the beginning of red wine fermentation helps preserve the grapes’ natural tannins so they can combine with anthocyanins to create optimal color or stability. Mouthfeel is also enhanced. FT Rouge provides antioxidative protection and may inhibit oxidative enzymes (such as laccase) associated with browning.

FT Rouge Berry during alcoholic fermentation in combination with yeast strains that have beta-glycosidase activity (Lalvin 71B™, Lalvin ICR VIE®) allows for the development of enhanced red berry characters. Resulting wines present intense aromas of cherry, strawberry, and blueberry, which complement varietal and fermentation aromas. FT Rouge Berry can also diminish green/vegetative notes in underripe fruit.

FT Rouge Berry promotes the stabilization of color and prevents oxidation of the primary aromas.

Gradually pour directly on grapes at the crusher or add to the must during a pump-over to obtain good homogenization. If subsequent additions are desired, this can be done in increments of 0.5 lb/1000 gal (~60 ppm) during pump-overs. If an addition is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

Dated expiration. Unopened, shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

Scott’Tan™ FT Rouge is a mixture of condensed tannins extracted from the wood of red berry plants. The use of FT Rouge Berry during alcoholic fermentation helps preserve the grapes’ natural tannins so they can combine with anthocyanins to create optimal color or stability. Mouthfeel is also enhanced. FT Rouge provides antioxidative protection and may inhibit oxidative enzymes (such as laccase) associated with browning.

Gradually pour directly on grapes at the crusher or add to the must during a pump-over to obtain good homogenization. If subsequent additions are desired, this can be done in increments of 0.5 lb/1000 gal (~60 ppm) during pump-overs. If an addition is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

Dated expiration. Unopened, shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

Scott’Tan™ FT Rouge Soft is a proprietary tannin specifically formulated for its gentle impact. It is particularly suitable for Pinot noir and early-release wines. FT Rouge Soft is reactive with natural grape proteins and thus helps promote optimal color and color stability while enhancing structure. Mouthfeel and roundness are improved while the potential for bitter characters is reduced.

FT Rouge Soft provides antioxidative protection.

Gradually pour directly on grapes at the crusher or add to the must during a pump-over to obtain good homogenization. If subsequent additions are desired, this can be done in increments of 0.5 lb/1000 gal (~60 ppm) during pump-overs. If an addition is made post-fermentation, we recommend waiting 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

Dated expiration. Unopened, shelf-life is 4 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

Scott’Tan™ Onyx is derived from French oak. It was designed for use in red and rosé wines to bring out berry and sweet red fruit notes. Onyx is known for maintaining varietal characteristics while adding complexity and minimizing greenness. It helps soften and integrate flavors.

Scott’Tan™ Radiance is a blend of tannins for use in white, red and rosé wines as well as ciders. It will help unmask and refine aromas and flavors of fresh fruit, vanilla, coconut and caramel. Radiance promotes balance and mouthfeel while maintaining acidity. Radiance integrates rapidly and is great for “last-minute” additions. Can be added up to 48 hours before membrane (final) filtration. Always conduct filterability trials prior to addition to avoid filtration challenges.

Scott’Tan™ Onyx is derived from French oak. It was designed for use in red and rosé wines to bring out berry and sweet red fruit notes. Onyx is known for maintaining varietal characteristics while adding complexity and minimizing greenness. It helps soften and integrate flavors.
Scott’Tan™ Riche is a cellaring and finishing tannin notable for enhancing complexity. Derived from 100% toasted French oak, Riche imparts hints of coconut and vanilla together with a perception of sweetness. It can contribute the final touch to your wine.

### Usage
Dissolve in about 10 times its weight of warm water (35–40°C/95–104°F) then add it to the wine and mix well. Good homogenization is important. Final additions should be made at least 3 weeks prior to bottling. After additions, proceed with normal racking.

### Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

### Dosage
| White/Rosé Wine | 30–100 ppm | 0.25–0.83 lb/1000 gal |
| Red Wine | 30–200 ppm | 0.25–1.6 lb/1000 gal |

Scott’Tan™ Riche Extra was specifically developed from 100% American oak. This proprietary tannin contributes nuances similar to Scott’Tan™ Riche but with heightened perception of vanilla. Riche Extra can help smooth a wine’s finish.

### Usage
Dissolve in about 10 times its weight of warm water (35–40°C/95–104°F) then add it to the wine and mix well. Good homogenization is important. Final additions should be made at least 3 weeks prior to bottling. After additions, proceed with normal racking.

### Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

### Dosage
| White/Rosé Wine | 30–100 ppm | 0.25–0.83 lb/1000 gal |
| Red Wine | 30–200 ppm | 0.25–1.6 lb/1000 gal |

Scott’Tan™ Uva’Tan is composed entirely of grape tannins (seeds and skins). It is high in polyphenols and low in astringency. Uva’Tan can be used both during fermentation and later during cellaring and finishing. For fermentation, Uva’Tan is particularly useful when natural grape tannin levels are deficient. Post-fermentation it can be used to stabilize color, enhance structure and provide antioxidant protection. Used prior to barreling it can improve integration of tannins in wines. It is recommended that Uva’Tan additions be made well in advance of bottling (six weeks at least) for better integration. Additions closer to bottling will still have a beneficial effect but filtration throughput will likely be reduced.

### Usage
Pour Uva’Tan evenly on the must/juice at the crusher or into wine during a transfer or racking. If further additions are required, two to three adds can be made after racking. Final additions can be made up to three weeks before bottling, though six weeks are recommended for a more complete polymerization, settling, and optimal filtration.

### Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

### Dosage
| Red Must | 50–400 ppm | 0.42–3.3 lb/1000 gal |
| White Wine | 50–150 ppm | 0.42–1.2 lb/1000 gal |
| Rosé Wine | 50–200 ppm | 0.42–1.6 lb/1000 gal |
| Red Wine | 50–300 ppm | 0.42–2.5 lb/1000 gal |

Scott’Tan™ Uva’Tan Soft is composed entirely from white grape skin tannins extracted from fresh grapes immediately after pressing to avoid oxidation of polyphenols. These highly reactive tannins have very low astringency. Like Uva’Tan, Uva’Tan Soft can be used in fermentations as well as in cellaring and finishing. During fermentation Uva’Tan Soft is useful when the grapes’ natural tannins are insufficient and softness is a concern. Post-fermentation it can be used to stabilize color, soften structure and provide antioxidant protection. Used prior to barreling it can improve integration of tannins. Additions of Uva’Tan Soft should be made well in advance of bottling (six weeks at least). Additions closer to bottling may still have a beneficial effect but filtration throughput will likely be reduced. At low dosages, Uva’Tan Soft will optimize the aging potential of white and rosé wines.

### Usage
Pour Uva’Tan Soft evenly on the must/juice at the crusher or into wine during a transfer or racking. If further additions are required, two to three adds can be made after racking. Final additions can be made up to three weeks before bottling, though six weeks are recommended for a more complete polymerization, settling, and optimal filtration.

### Storage
Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

### Dosage
| Red Must | 50–400 ppm | 0.42–3.3 lb/1000 gal |
| White Wine | 50–150 ppm | 0.42–1.2 lb/1000 gal |
| Rosé Wine | 50–200 ppm | 0.42–1.6 lb/1000 gal |
| Red Wine | 50–300 ppm | 0.42–2.5 lb/1000 gal |
OAK CHIPS

FEELWOOD! BALANCE & STRUCTURE
Boosts ripe fruit, masks vegetative characteristics
Red, White, Rosé
#15942 10kg (2 x 5kg units) $120.00

FEELWOOD! SWEET & FRESH
Enhances fruit profile, sweetness and length
Red, White, Rosé
#15940 10kg (2 x 5kg units) $80.00

These 100% untoasted French oak chips are used during fermentation to enhance fruit, add mid-palate sweetness and increase the length of the finish. Feelwood! SWEET & FRESH chips are aged for 24 months.

Dosage
- For Whites, Rosé: 0.5-1 g/L, 50-100 g/hL, 4.15-8.3 lb/1000 gal
- For Reds: 1-3 g/L, 100-300 g/hL, 8.3-25 lb/1000 gal

Usage
- For whites and rosés, chips must be used with infusion bags.
- For reds, chips can be removed from infusion bags and added directly into the tank while filling if preferred.

Storage
- Dated expiration. Unopened, the shelf-life is 4 years at 25°C (77°F). Once opened, keep tightly sealed and dry.

Contact: 1–18 months
Surface area: 1 sq. ft.
Size: 36” x 1 1/16” x 13/16”
Package Size: 20 lb bag
Dosage rate: 1 per 60 gal

OAK INFUSION PRODUCTS/BARREL ALTERNATIVES

Oak has been used to ferment and store wine for centuries. Oak impacts wine color, texture and structure. Its volatile flavor components are an important contributor and driver of many wine styles. Oak barrels are the traditional way to impart oak character, but barrels are costly. Modern winemaking includes the use of oak infusion products and other barrel alternatives to impart oak character to wine while saving money, space and labor.

Scott Laboratories launched The Oak Lab™ last year to provide high quality oak infusion products and barrel alternatives. Using our products alone, or in conjunction with our full range of Scott’Tan™ tannins, enables winemakers the freedom to craft wines to achieve their oak goals.

Please visit theoaklab.com for more information.

FEELWOOD! SWEET & FRESH
Enhances fruit profile, sweetness and length
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The Thermic range of oak infusion products and barrel alternatives are produced using a breakthrough modification process that we call Thermic. The Thermic process provides a level of accuracy and consistency superior to other products that are toasted, baked, or electrically radiated. Using only wood and heat, our Thermic process occurs under vacuum in an oxygen-free and combustion-free environment, enabling the creation of a wide spectrum of flavor profiles.

Thermic Product Description

<table>
<thead>
<tr>
<th>Aroma</th>
<th>Thermic Profile 1</th>
<th>Thermic Profile 2</th>
<th>Thermic Profile 3</th>
<th>Thermic Profile 4</th>
<th>Thermic Profile 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh fruit</td>
<td>coconut, sweet</td>
<td>nutty, toasty,</td>
<td>vanilla, dark</td>
<td>warm, rich,</td>
<td>espresso, smoked</td>
</tr>
<tr>
<td>Mid-palate</td>
<td>oak</td>
<td>toffee</td>
<td>fruits, complexity</td>
<td>spice, vanilla</td>
<td>meat</td>
</tr>
<tr>
<td>Texture</td>
<td>fresh and light,</td>
<td>round</td>
<td>volume, length</td>
<td>full, viscous,</td>
<td>balanced, rich,</td>
</tr>
<tr>
<td>Weight</td>
<td>addition of</td>
<td></td>
<td></td>
<td>rich</td>
<td>round</td>
</tr>
<tr>
<td>Complexity</td>
<td>length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Single Rod

Single rods are added to tanks during the aging process. Rods can be used in loose form or stacked in a matrix formation at the base of the tank. Available in Thermic Profiles 1–5.

| Size, 36” x 1 1/16” x 13/16” | $5.50          |
| Surface area, 20 sq. ft.     |                |
| Dosage rate, 20 rods per 1000 gal |                |
| Contact time, 1–18 months    |                |
| Wood variety, Quercus alba   |                |

Fan Pack

Fan packs are added to tanks during fermentation and aging process. Fan packs are round by food grade nylon zip ties to allow for easy installation and removal. Available in Thermic Profiles 1–5.

| Size, 20 rods, 36” x 1 1/16” x 13/16” | $90.00 |
| Surface area, 20 sq. ft.              |        |
| Dosage rate, 3–8 per 1000 gal         |        |
| Contact time, 1–18 months             |        |
| Wood variety, Quercus alba            |        |

Bung Sleeve Insert

Bung sleeves are added during the fermentation and aging process and are added to barrels directly through the bung hole. Each sleeve is made of 20 sections of oak in food grade polyethylene netting and fastened to the barrel bung with a #304 stainless steel eyelet. Available in Thermic Profiles 1–5.

| Size, 20 sections, 9” x 1 1/16” x 13/16” | $80.00 |
| Surface area, 5.5 sq. ft.               |        |
| Dosage rate, 1 per 60 gal               |        |
| Contact time, 3–12 months               |        |
| Wood variety, Quercus alba              |        |

CUBE BAG

Cube bags are added to tanks during fermentation, aging, and just before bottling to quickly add oak (flashing). Cubes are added to tanks in sewn, food grade polyethylene infusion bags. Available in Thermic Profiles 1–5.

| Package Size, 20 lb bag | $200.00 |
| Cube size, 36” x 1 1/16” x 13/16” |        |
| Surface area, 24 sq. ft. |        |
| Dosage rate, 2–8 bags per 1000 gal |        |
| Contact time, 1–9 months |        |
| Wood variety, Quercus alba |        |

BUNG SLEEVE INSERT

Bung sleeves are added during the fermentation and aging process and are added to barrels directly through the bung hole. Each sleeve is made of 20 sections of oak in food grade polyethylene netting and fastened to the barrel bung with a #304 stainless steel eyelet. Available in Thermic Profiles 1–5.

| Size, 20 sections, 9” x 1 1/16” x 13/16” | $80.00 |
| Surface area, 5.5 sq. ft. |        |
| Dosage rate, 1 per 60 gal |        |
| Contact time, 3–12 months |        |
| Wood variety, Quercus alba |        |
The phenolic content of grapes is influenced by grape variety, climatic conditions and viticultural practices. Phenolic compounds impact wine color, taste and mouthfeel. It is the polymerisation of phenols in grapes that creates tannins. In addition to their antioxidant properties, tannins provide mid-palate texture and stabilize color by condensing with anthocyanins to create polymeric pigments.

Tannins can play a role in improving wines made with rot-compromised grapes. Tannin additions to the grape stage can combat many of the negative effects cause by Botrytis cinerea and other rot-causing organisms. Botrytis grows intraerially and infects fruit, under the grape skin, secreting a damaging and stable enzyme called laccase. Depending on the mold and bacteria present, serious enological issues such as oxidative browning, degradation of color and aromatic compounds, as well as clarification and possibly filtration challenges can occur. Early tannin additions can minimize these damaging effects.

Even in healthy grapes, nature often conspirises to provide conditions that are less than ideal for phenolic development in the vineyard and/or phenolic extraction during winemaking. Enological tannins can be used to make up for phenolic deficiencies.

**TANNINS USED IN WINEMAKING: ORIGIN, EFFECTS AND IMPACTS**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Tannin type</th>
<th>Tannin Source</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oak</td>
<td>Gallic tannins</td>
<td>Heartwood</td>
<td>Protects from oxidation during fermentation and maturation.</td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAPE SKIN</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAPE SEEDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GALL NUT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QUEBRACHO</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TARA TREE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OAK</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tannins</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FREQUENTLY ASKED QUESTIONS: OAK & TANNINS**

When is the best time to add fermentation tannins and/or oak chips? How do I add them?

Fermentation tannins and oak chips are best added early in the winemaking process. In red wine, an addition during the fermentation stage integrates tannin into the wine and offers the greatest opportunity for color stability and increased mid-palate structure. Tannins can be added at the crusher or to the tank during the first pump-over, depending on the grape variety (rotten vs. sound). Additional tannin can be added with each pump-over. If adding tannins to a white wine, add directly to the grapes at the crusher or to the tank during a tank mixing.

Oak chips can be added at the time of filling the tank or after settling. Using mesh bags (chips or cubes) is often the easiest method. Make sure the bags remain below the cap to avoid fermentation problems.

I am using tannin and enzymes. Will SO2 interfere with my additions?

Using all three products together is fine, but timing is important. High SO2 inhibits laccase enzyme activity. Do not add SO2 and enzymes at the same time. It is okay to add enzymes after the SO2 is adequately dispersed or OR to add SO2 after the enzymes are adequately dispersed. Follow with a tannin addition six to eight hours later. When enzymes are not being used, add SO2 first, allow to disperse, then follow with the tannin addition. (See more information on pg 86.)

Can I use tannins or oak on white juices and wine?

Yes, a tannin addition in white juice may be beneficial to remove off-aromas, to improve clarification, to inhibit laccase activity from Botrytis or rot, or to serve as an antioxidant. We recommend using either Scott`Tan Uva`Tan, Scott`Tan Uva`Tan Soft, Scott`Tan FT Blanc, Scott`Tan FT Blanc Citrus or Scott`Tan FT Blanc Soft. Tannins can also be added later to wine to improve mid-palate structure or softness. Oak can also be used with similar results. Oak may also bring toasted oak or sweet oak characteristics depending upon the toast level of the product.

Why should I use tannins or oak on my "premium" red grapes?

Tannins can be used to protect the color and phenolic structure of your wines. For the easiest and most efficient integration of tannins, add Scott`Tan FT Rouge, Scott`Tan FT Rouge Soft, or Scott`Tan FT Rouge Berry at the crusher. If needed, an addition of Scott`Tan Uva`Tan, Scott`Tan Uva`Tan Soft or Scott`Tan Estate prior to aging can help reinforce phenolic balance. During long maturation in barrels, Estate will help prevent excessive oxidation that can result in loss of structure and freshness. For improved SO2 management add small amounts of Estate (5–7.5 g/L) during each racking.

Oak has long been used in red wine production and brings increased structure, mouthfeel and aromatics to red wines. See our line of products on pages 75-76 for more details.

Will tannin additions increase color in low-color grape varieties?

Tannins do not add color to the must of low color grapes. Recent research indicates that early addition of tannins, such as FT Rouge, brings up available proteins. This preserves grape's own natural tannins making them available to bind with grape anthocyanins, thereby providing increased color stability.

What if I did not add enough tannin during the primary fermentation?

If increased tannin structure and flavor is desired post-fermentation, Scott`Tan Riche Extra Addition is best before barrel aging when tannins can be incorporated into the wine and when oxidation and polymerization are slow. Scott`Tan Riche, and Scott`Tan Riche Extra are the best tannins to use prior to bottling (3–6 weeks) when a bit of oak influence is desired. Any of these tannins can be used throughout winemaking, depending on the desired effect. Bench trials are required to determine the best tannin for a particular wine or style.

Oak infusion products can be added before or after fermentation to boost tannin structure and elevate aromatics. In addition, oak infusion products can add oak aromas and mask vegetative characters.

Will adding tannins or oak inhibit barrel aging?

Tannins protect wine from oxidation during barrel aging. The wood tannins extracted from a new barrel protect the wine from over-oxidation during the slow process needed for tannin polymerisation and wine development. When using old barrels, indigenous tannin may have been completely leached out. A small tannin addition of 5–10 g/L of Scott`Tan Estate will act as an antioxidant and help protect the wine. Attaining a good phenolic profile will slow the maturation process and still protect the wine.

Oak infusion bung sleeve inserts can be used to impart new oak aromas and flavors while using neutral barrels.

Can tannins or oak help remove undesirable astringency or bitterness?

Yes. Over- astringency is caused by an imbalance of tannin molecules or by insufficiently bound tannin complexes. By adding either a more refined, highly polymerized tannin or oak infusion product to the wine, balance can be restored and the perception of astringency or bitterness reduced. This frequently improves the perception of fruit.

What if I want to use pure grape tannins in my wine?

Scott`Tan Uva`Tan (tannins from grape skins and seeds) and Scott`Tan Uva`Tan Soft (tannins from white grape skins only) are comprised of 100% grape tannin. All other tannins are sourced from a combination of grapes, exotic woods, oak or chestnut.

Why can ONLY Onyx, Radiance and Royal be added 48 hours before bottling?

Scott`Tan Onyx, Scott`Tan Radiance and Scott`Tan Royal undergo a specific extraction process. The tannins are extracted from heartwood at low temperature which makes them easily soluble in the wine matrix. This process reduces the concentration of high molecular weight compounds which greatly reduces the risk of any precipitation.

Will Onyx, Radiance and Royal cause filtration problems?

These tannins have undergone extensive research under various conditions. No filtration problems were found 48 hours after the tannin addition. It is not recommended to filter less than 48 hours after addition.
Enzymes have been used in the fruit industry since the 1930s. Scott Laboratories began offering specialized enzymes for grapes over 25 years ago. In the early days, enzymes for grapes were poorly understood pectinases meant for increasing juice yields. After decades of experience and research we now provide enzymes that are a blend of pectinases (polygalacturonase, pectin methylsterase and pectin lyase) or a blend of pectinases with interesting properties like cellulase and glycosidase side-activities. Winemaking enzymes are used to accelerate natural reactions that would otherwise occur slowly in grapes, juice, must, and wine. Grape skins and grape pulp are rich in pectin, a structural polysaccharide, linked together into a matrix with other molecules such as cellulose and hemicellulose. Pectin is the backbone that gives grape cells firmness and structure; it is a viscous compound that can impede filtration, clarification, extraction, and aroma expression. Pectin can be highly branched with many side chains, affecting the efficiency of every enzyme blend.

Enzymes can be used to increase yield before fermentation, improve aromas and mouthfeel as well as improving clarification and filtration. At almost every stage in the winemaking process proper enzyme use can improve quality and save costs.

### SELECTING ENZYMES FOR SUCCESS

It is important to match the winemaking goal, enzyme blend and correct dosage to achieve maximum success. The amount of enzyme necessary to achieve success will depend on: the method of harvest, varietal, pectin content, skin thickness, contact time, grape chemistry (pH and temperature) and the presence of inactivating agents like SO₂, bentonite and tannins. Consider the following when choosing an enzyme and determining its dosage:

<table>
<thead>
<tr>
<th><strong>VARIEGAL OPTIMIZATION</strong></th>
<th><strong>CLARIFICATION &amp; PRESSING</strong></th>
<th><strong>COLOR &amp; PHENOLICS</strong></th>
<th><strong>MOUTHFEEL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin contact enzymes can help release bound aroma precursors into the must or juice.</td>
<td>Enzymes break down grape pulp thereby releasing trapped juice, decreasing solids, increasing yield and resulting in higher quality juice. Press cycles are optimized and lees are more compact.</td>
<td>Enzymes accelerate the release of anthocyanins and tannins resulting in wines with brighter, more stable color and enhanced structure.</td>
<td>Enzymes promote tannin extraction which impacts mouthfeel. Some enzymes, like beta-glucanase will aid with yeast autolysis, releasing mannoproteins which increases mouthfeel and sweetness perception.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>AROMA REVEALING</strong></th>
<th><strong>SUGAR LEVEL</strong></th>
<th><strong>FILTRATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aroma compounds, if not released from their precursor form, can be undetectable. Some enzymes have the ability to release these compounds after fermentation.</td>
<td>Enological beta-glucosidase/glycosidase enzymes are inhibited by sugar. It is recommended that these enzymes are used post-fermentation once the sugar level is &lt;0.5°Brix.</td>
<td>Grapes impacted by Botrytis can be filtration nightmares. Enzymes help break down glucans and other polysaccharides that are colloidal in nature and can make the wine very difficult to filter.</td>
</tr>
</tbody>
</table>

### CHOOSING ENZYMES

<table>
<thead>
<tr>
<th>CHOOSING ENZYMES</th>
<th>Lallzymes</th>
<th>Rapidase</th>
<th>Scottzymes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highly Recommended</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Note: The ingredients in MMX are listed by the TTB as acceptable in good commercial winemaking practice in 27 CFR 24.250. For more information, please visit <a href="http://www.TTB.gov">www.TTB.gov</a>. All other enzymes are listed in CFR 24.246.</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**LALLYZME CUVEÉ BLANC**

Skin contact enzyme to release aroma precursors

**Dosage**

<table>
<thead>
<tr>
<th>Red Grapes</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 g</td>
<td>$39.00</td>
<td></td>
</tr>
</tbody>
</table>

Dissolve Lallzyme CUVEÉ Blanc in 10 times its weight of water, gently stir and allow to sit for a few minutes. Add directly to the grapes or add in the press.

**Usage**

Dissolved expirration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

**Stage of Winemaking**

White Grapes, Red Grapes

**Activity**

Pectinase, Cellulase, Hemicellulase

**Impact**

Enhanced structure and color

*LALLYZME EX-V™*

Macerating enzyme for medium to full-bodied reds

**Dosage**

<table>
<thead>
<tr>
<th>Red Grapes</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 g</td>
<td>$39.00</td>
<td></td>
</tr>
<tr>
<td>500 g</td>
<td>$110.00</td>
<td></td>
</tr>
</tbody>
</table>

Lallzyme EX-V™ is a granular enzyme with pectinase, cellulase and hemicellulase activities for use in red wines intended for aging. It has a specific action on grape cell walls and cell membranes that allows for rapid and efficient release of anthocyanins and tannins leading to stable polymeric pigments. This results in structured wine with deep, stable color. Aromatic analysis shows that Lallzyme EX-V™ increases the release of aromatic compounds while respecting varietal characteristics.

**Usage**

Dissolve Lallzyme EX-V in 10 times its weight of water, gently stir and allow to sit for a few minutes. Add to the grapes at the beginning of fermentation or the onset of cold soak.

**Stage of Winemaking**

Red Grapes

**Activity**

Pectinase, Cellulase, Hemicellulase

**Impact**

Impact: Gentle juice extraction and fast clarification after pressing.

*RAPIDASE CLEAR EXTREME™*

**Dosage**

<table>
<thead>
<tr>
<th>Crushed Grapes</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 g/L</td>
<td>Not recommended</td>
<td></td>
</tr>
<tr>
<td>38-152 g/1000 g</td>
<td>Not recommended</td>
<td></td>
</tr>
</tbody>
</table>

Hybrid and American grape varieties may be difficult to clarify. Rapidase® Clear Extreme is a granular enzyme that can be used after pressing to preserve aromatic freshness, reduce viscosity, improve juice clarity, help compact less and speed clarification even in difficult conditions (low temperature, low pH, high acidity) to settle varieties. Rapidase Clear Extreme will remain active at 6-50°C(43-122°F).

**Usage**

Dissolve Rapidase Clear Extreme in 10 times its weight of water, stir gently, allow to sit for a few minutes, then add to the juice right after pressing.

**Stage of Winemaking**

Juice Settling

**Activity**

Pectinase

**Impact**

Clarification under extreme conditions

**RAPIDASE EXPRESSION AROMA™**

For extraction of aroma precursors

**Dosage**

<table>
<thead>
<tr>
<th>Crushed Fruit</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-25 g/ton</td>
<td>Not recommended</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

Dissolve Rapidase Expression Aroma in 10 times its weight of water, stir gently, allow to sit for a few minutes. Pour over fruit or add in the press.

**Stage of Winemaking**

White grapes

**Activity**

Pectinase

**Impact**

Varietal optimization

---

**LALLYZME MXM™**

Enzyme to increase yeast autolysis rates and/or to improve filterability of botrytized wines

**Dosage**

<table>
<thead>
<tr>
<th>Red Grapes</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 g</td>
<td>$18.00</td>
<td></td>
</tr>
</tbody>
</table>

Lallzyme MXM™ is a granular enzyme with pectinase and hemicellulase activities to improve yeast stability and mouthfeel in red wines. Specific side activities contribute to the macerating action on the grape cell wall which allows progressive liberation of polyphenos and tannin bound-poly saccharides. MXM increases juice extraction, improves wine filterability and provides gentle maceration, even in low-maturity grapes.

**Usage**

Dissolve Lallzyme MXM in 10 times its weight of water, gently stir and allow to sit for a few minutes. Add directly to grapes at the beginning of fermentation or start of cold soak.

**Stage of Winemaking**

Red Grapes

**Activity**

Pectinase, Hemicellulase

**Impact**

Gentle extraction of juice and color

---

**ENZYMES FOR AMERICAN AND HYBRID GRAPE VARIETIES**

All grapes contain pectin, a polysaccharide responsible for holding the fruit in its semi-solid state. Most native American grape varieties and their hybrids tend to have higher levels of pectin compared to Vitis vinifera. This pectin can inhibit juice extraction and clarification, wine sedimentation, and create negative filtrations, clogging filter media and significantly increasing costs.

Pectins can be broken down using pectinase enzymes. There are many types of pectinases. Some are stronger and some gentler. Side activities also affect the action of the pectinase. Those side activities may include protease, cellulase, and hemi-cellulases activities which aid the breakdown of grape cell walls and help extract color, tannin and flavor. The gentlest pectinases (e.g. Rapidase Expression Aroma) are designed to extract the juice of white grapes without breaking down solids and extracting potentially bitter phenolics.

All pectinases will aid the settling of solids in both juice and wine. However, some American and hybrid grapes may require further help with additional enzymes at the juice stage (e.g. Rapidase Clear Extreme, Scottzyme Pec5L and Scottzyme HC) to help settling. Generally, red grapes will require stronger enzymes with more side activities for early extraction of color and tannins. Scottzyme ColorPro, Scottzyme HC and Lallemand EX-V™, in years with high fungal pressure, these enzymes will help short- en maceration times to allow for early pressing and separation of the wine from infected solids.

Once the wine is made, some of the highest pectin varieties (such as Concord, Edelweiss, and other varieties with Vitis labrusca in their background) may be difficult to filter. The most effective treatment is with the strongest enzymes (e.g. Scottzyme KS and KS Plus), which should never be used on the actual fruit. To aid the final clarification and filtration, Scottzyme KS can be used on white juice or finished wine, while Scottzyme KS Plus should only be used on finished wine.

Several enzymes have very specialized activities. One of these is glycosidase activity (e.g. Scottzyme BG, Rapidase Revelation Aroma). Many aroma compounds, especially terpenes, are bound to sugars. These glycosides have no aroma and require either enzymes or temperature and acid hydrolysis to release them as free aromatic compounds. These enzymes are most effective on finished wine since sugar inhibits their action. The other specialized activity is that of beta-galactosidase (Lallemand MMX). Wines heavily infected by Botrytis often have high levels of glucans that are not affected by regular pectinases and cause nightmare filtrations. Lallzyme MMX breaks down the glucans and improves the filterability of botrytized wines.

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*Note: The above information is a summary of key features and uses of enzymes for winemaking, focusing on their effectiveness in various stages of winemaking and the types of grape varieties they are best suited for.*
**RAPIDASE REVELATION AROMA**

For fast, early release of varietal aroma precursors

#16266 100g $51.00

Rapidase® Revelation Aroma is a granular enzyme that contains alpha- and beta-glycosidase activities to breakdown sugar-bound aroma precursors. Respects varietal characters and increases thioles and terpenes for intense and complex aromas. Since glycosidase activity is inhibited by high sugar levels, Revelation Aroma addition after fermentation gives good results. Once the desired aroma has been obtained, enzyme can be halted via a benomonte addition.

**Usage**

Dilute Rapidase Revelation Aroma in 10 times its weight of water. Stir gently, let sit for a few minutes. Pour over crushed fruit, add to the juice before the start of alcoholic fermentation, or add to wine post-fermentation.

**Storage**

Dated expiration. Store refrigerated at 4–8°C (40–45°F). Once rehydrated, use within a few hours.

**Dosage**

Crushed Fruit 

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking</th>
<th>Activity</th>
<th>Impact: Aroma release</th>
</tr>
</thead>
<tbody>
<tr>
<td>15–25 g/ton</td>
<td>Crushed Grapes Juice Wine</td>
<td>1-1.5 g/L, 35-55 g/1000 gal</td>
<td>1-2 g/L, 35-70 g/1000 gal</td>
</tr>
</tbody>
</table>

**SCOTTZYME CINN-FREE**

Aroma releasing enzyme for white, red and fruit wines

#16175 1 kg (800 mL) $93.00
#16165 25 kg (22.25 L) $1314.00

Scotzyyme Cinn-Free is a purified liquid pectinase with very low cinnamyl esterase activity which helps reduce the formation of vinyl phenols. It is used in white must for the release of varietal aromas and aromatic precursors. In addition to releasing desirable pectin-trapped aromas, Scotzyyme Cinn-Free aids in pressability, yield, settling, clarification and filtration.

**Usage**

Scotzyyme Cinn-Free is used in white wines for the early release of varietal aromas and color precursors. It is not recommended in reds.

**Dosage**

Crushed Grapes Juice Wine

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking:</th>
<th>Activity:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>15–30 mL/ton</td>
<td>Crushed Grapes Juice Wine</td>
<td>Pectinase and beta-glucosidase</td>
<td>Aroma release</td>
</tr>
</tbody>
</table>

**SCOTTZYME KS**

Blend of enzymes for enhanced settling and filtration

#16174 1 kg (800 mL) $80.00
#16164 25 kg (22.25 L) $1016.00

**Usage**

Dilute Scottzyme SC Color Pro to approximately a 10% solution in cool water. Pour the solution over the crushed grapes, or add directly to tank and mix thoroughly.

**Dosage**

Crushed Grapes Juice Wine

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking:</th>
<th>Activity:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>60–100 mL/ton</td>
<td>Crushed Grapes Juice Wine</td>
<td>Pectinase and protease</td>
<td>Color and structure in red, clarification in whites</td>
</tr>
</tbody>
</table>

**SCOTTZYME COLOR PRO**

Macerating enzyme for aged and early-to-market reds, whites

#16172 1 kg (800 mL) $80.00
#16162 25 kg (22.25 L) $1016.00

**Usage**

Macerate Scottzyme Color Pro in cool water. Pour over the grapes before pressing or add to juice before the start of alcoholic fermentation.

**Dosage**

Crushed Grapes Juice Wine

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking:</th>
<th>Activity:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not recommended</td>
<td>Crushed Grapes Juice Wine</td>
<td>Pectinase and protease</td>
<td>Color and clarification in whites</td>
</tr>
</tbody>
</table>

**SCOTTZYME KS**

Aroma releasing enzyme for white, red and fruit wines

#16176 1 kg $202.00

Scotzyyme® BS is a powdered pectinase with beta-glucosidase side-activities for the release of bound terpenes. It is generally used in white wines, but may also be used in red, rosé and fruit wines for the release of aroma and flavor compounds. BS should be used only at the end of fermentation, never on grapes or in juice as the glucosidase activity is inhibited by sugars. The wine should have less than 0.5% residual sugar for proper enzyme activity.

**Dosage**

Crushed Grapes Juice Wine

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking:</th>
<th>Activity:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not recommended</td>
<td>Crushed Grapes Juice Wine</td>
<td>Pectinase and protease</td>
<td>Aroma release</td>
</tr>
</tbody>
</table>

**SCOTTZYME PEC5L**

Enzymes

**Usage**

Dissolve Scottzyme BS in 10 times its weight of cool water, stir gently, allow to sit for a few minutes and add to wine.

**Storage**

Store at room temperature for 1–2 years. Once opened, keep tightly sealed and refrigerated once opened.

**Dosage**

Crushed Grapes Juice Wine

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Stage of Winemaking:</th>
<th>Activity:</th>
<th>Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not recommended</td>
<td>Crushed Grapes Juice Wine</td>
<td>Pectinase and protease</td>
<td>Color and clarification in whites</td>
</tr>
</tbody>
</table>
SCOTTZYME KS PLUS
Enzyme blend for enhanced clarification and filtration of difficult lots

SCOTTZYME PEC5L
Pressurability, setting and clarification for white and fruit wines

**Dosage**

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Juice</th>
<th>Wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mL/hL</td>
<td>150 mL/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Usage**

Dilute Scottzyme KS Plus to approximately a 10% solution in cool water. Add to the juice after alcoholic fermentation during a tank makeup.

**Warning**

Never use Scottzyme KS Plus before pressing or to the juice before the start of alcoholic fermentation.

**Storage**

Store at 4°C(39°F) in water acidified with tartaric acid to pH 3.5 around 200 ppm. Do not add SO2 and enzymes together. It is okay to add enzymes after the SO2 is adequately dispersed or wait 6-8 hours later.

**FREQUENTLY ASKED QUESTIONS: ENZYMES**

**What is the best way to add liquid enzymes?**

First calculate the dosage then dilute Scottzymes to approximately a 10% solution (v/v) in cool water (see below). Pour the solution over the crushed grapes/fruits or during a pump-over before fermentation. If adding to juice or wine, gently mix a 10% solution into the tank for even dispersion. Thorough mixing is important.

**What should I do if the optimal time to add enzymes has passed?**

Low temperatures, alcohol and SO2 all inhibit enzyme activity, but the enzymes will still work. This is why recommended enzyme dosage levels for wine are higher than for juice in most cases. Reaction time will also increase when conditions are not optimal.

**I have problems settling and clarifying my late harvest white wines.**

When should I treat with Scottzyme KS Plus? Scottzyme KS is best to add Scottzyme KS before pressing and before fermentation. If added later, you will need a higher dose and a longer reaction time in the wine. If you know you have problems with a specific white wine, add Scottzyme KS to the juice tank. Preventative use is more effective and quicker.

**Warning:** Do not use Scottzyme KS Plus before pressing. Never use Scottzyme KS in red grapes or must.

**I have enzymes left from last year. Are they still OK to use?**

Leftover liquid Scottzymes should be tightly sealed and stored in a refrigerated environment. Granular enzymes should be kept in a dry, cool environment. If the dry enzymes get moisture in them, they should be thrown out. If kept properly, liquid enzymes should be good for at least one year with only a small activity loss. Granular enzymes will be good for several years.

**I had trouble on my grapes this harvest and I want to use a beta-glucanase enzyme. Do you carry a beta-glucanase enzyme?**

Yes, Lallzyme MMX is a blend of beta-glucanase and pectinase. It is currently listed in 27 CFR 24.256.

**How long should I leave the enzymes on white grapes before pressing?**

In general, waiting 2-12 hours before pressing should be enough time for the enzyme to work.

**I am using tannin and enzymes. Will SO2 interfere with my additions?**

Using all three products together is fine, but timing is important! High SO2 content can inhibit enzyme activity. Do not add SO2 and enzymes together. It is okay to add enzymes after the SO2 is adequately dispersed or wait 6-8 hours later. Yeast derivative nutrients (e.g. Opti-Rad) can be added at any point during fermentation.

**Impact of Scottzyme KS Plus on Turbidity after Four Day Settling at Room Temperature**

**Expert Tip from Our Filtration Specialist**

A powerful enzyme such as Scottzyme KS Plus has a great fringe benefit in that it can unclog crossflow and cartridge filters. This is especially useful after filtering colloidal and dramatic wines, or specific varietals with naturally higher pectin levels that tend to struggle on filtration day (assuming 10% filtration was done properly and within the recommended 24 hour time limit, and a 20 psi differential has not been exceeded). Use KS Plus in the filter after filtration but before the alkaline cleaning cycle. The enzyme should always be used before a hot water or steam sanitization so the solids are not baked in. The use of the KS Plus will then enable a more successful cleaning.

**How to Make a 10% Solution**

<table>
<thead>
<tr>
<th>Solution Type</th>
<th>Volume Needed</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mL cylinder</td>
<td>20 mL enzyme</td>
<td>10% solution</td>
</tr>
<tr>
<td>180 mL H2O</td>
<td>20 mL enzyme</td>
<td>10% solution</td>
</tr>
</tbody>
</table>

**Scottzyme liquid enzymes are sold by weight but dosage recommendations are given in volume. What's the conversion?**

One kg of Scottzyme liquid enzyme equals 890 mL and 25 kg liquid enzyme equals 22.25 liters.

**How do I add powdered or granular enzymes?**

Granular enzymes need to be dissolved in 10 times their weight of water (for every gram of enzyme dissolve in 10 mL of water), gently stirred and allowed to sit for a few minutes. They are then ready to be added to juice or wine. Powdered enzymes tend to scatter across water or wine. It is best to add just enough cool water (~21°C/70°F) to the enzyme to create a paste. Then add more cool water to dissolve the enzyme completely. It is now ready to be added to the tank. Make sure you have gentle motion in the tank to disperse the enzyme or use a dosing pump.

**How long will powdered/granular enzymes remain active after rehydration?**

Rehydrated powdered/granular enzymes should not be kept in liquid form for more than a few hours at room temperature. The liquid solution of these enzymes may be kept a few days at 4°C(39°F) in water acidified with tartaric acid to pH 3.5 with 50 mL/SO2.

**Are enzymes deactivated by SO2?**

Yes, enzymes are inhibited by SO2. Deactivation occurs around 200 ppm. Do not add SO2 and enzymes together. It is okay to add enzymes after the SO2 is adequately dispersed or to add the SO2 after the enzymes are adequately dispersed.

**I have already added bentonite. Can I still use enzymes?**

You may still use enzymes but not until the wine has been racked off the bentonite. Bentonite inactivates enzymes. It is best to use bentonite after the enzyme treatment is complete.

**When should I add Scottzyme Color Pro, Lallzyme EX or Lallzyme EX-V?**

Add at the crusher or the fermenter as soon as possible. Yeast derivative nutrients (e.g. Opti-Rad) can be added at any point during fermentation.

**When should I choose Lallzyme EX or Lallzyme EX-V?**

Lallzyme EX is recommended for fruit forward red or rosé wines and EX-V is formulated for premium, aged reds.

**Why should I use Scottzyme Color Pro on whites?**

Scottzyme Color Pro improves setting, fining and filterability of white wines.
An important part of making wine is controlling microbes during pre-fermentation, fermentation, aging and packaging. Practices such as adding yeast and ML starter cultures, controlled sulfur dioxide additions, acidification, winery hygiene, and filtration are all ways in which microbial control is applied throughout the winemaking process. Though many wine spoilage problems can be prevented with good winemaking practices, there are still circumstances that require extra microbial control. This section describes some of the tools that Scott Laboratories offers to inhibit or eliminate unwanted microorganisms.

### CHOOSING MICROBIAL CONTROL AGENTS

<table>
<thead>
<tr>
<th>MICROBIAL CONTROL AGENTS</th>
<th>Highly Recommended</th>
<th>Recommended</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysozyme Sulfur Dioxide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chitosan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chitin-Glucan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lysovin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inodose Granules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inodose Tablets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium Metabisulfite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Brett Inside™</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bactiless™</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MICROBIAL CONTROL ACTION

#### REMOVAL

Microorganisms are physically removed from the wine. Removal strategies include filtration, centrifugation and some types of fining followed by racking.

#### INHIBITION

Microbe replication is slowed or stopped, but organisms are not necessarily killed. Microbes may start to grow and multiply once the inhibitory pressure is removed. Inhibition strategies include acidification to lower pH and use of sulfur dioxide and Lysovin at non-lethal concentrations.

#### DESTRUCTION

Microorganisms are killed and will not survive to replicate. Destruction strategies include No Brett Inside™ or Bactiless™ additions, use of Lysovin (especially at pH >4.0) and the addition of alcohol (as in the case of fortified wines).

### SELECTING MICROBIAL CONTROL AGENTS FOR SUCCESS

<table>
<thead>
<tr>
<th>INCREASING VOLATILE ACIDITY</th>
<th>HIGH pH WINEMAKING</th>
<th>ACETIC ACID BACTERIA (AAB)</th>
<th>LACTIC ACID BACTERIA (LAB)</th>
<th>YEAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA can be in-creased by stressed wine yeast, spoilage yeast and bacteria (acetic and lactic acid bacteria). In general, pre-fermentation VA increases are due to acetic acid bacteria and non-Saccharomyces yeast.</td>
<td>The higher the pH, the more diverse the microbial population. Careful attention to wine microbiology and chemistry is advised.</td>
<td>AAB are generally problematic in the pre- and post-fermentation phases. They are responsible for the oxidation of ethanol to acetic acid (VA), production of polynucleotides that can give clarification and filtration issues as well as changes in aromas and flavors. Control growth via Bactiless, Lysovin, No Brett Inside or SO₂. Generally accepted SO₂ levels to control microbes in winemaking are 0.5ppm molecular for bacteria and 0.8ppm molecular for yeast.</td>
<td>LAB are responsible for converting malic acid into lactic acid. Oenococcus oeni is favorably associated with malolactic fermentation (MLF) but can also produce volatile acidity (VA) under certain conditions. Pedococcus and Lactobacillus are usually considered spoilage organisms. Some LAB can convert sugar to VA. Control growth with Bactiless, Lysovin or SO₂.</td>
<td>Highly diverse group of organisms that can be both beneficial or detrimental depending on the stage of winemaking. Control growth post-fermentation with No Brett Inside if Brettanomyces is present and SO₂.</td>
</tr>
</tbody>
</table>

### MICROBIAL STABILIZATION

Strategies include pH, temperature management, thoughtful rackings, filtration and the use of Bactiless, Lysovin, No Brett Inside or SO₂. Generally accepted SO₂ levels to control microbes in winemaking are 0.5ppm molecular for bacteria and 0.8ppm molecular for yeast.

### YEAST

Highly diverse group of organisms that can be both beneficial or detrimental depending on the stage of winemaking. Control growth post-fermentation with No Brett Inside if Brettanomyces is present and SO₂.

### INHIBITION

- Protects from indigenous yeast
- Controls gram positive bacteria (Lactic Acid Bacteria)
- Controls gram negative bacteria (Acetobacter)
- Inhibit oxidation of grapes and juice
- Protection during stuck and sluggish fermentations
- Helps prevent refermentation in bottle
- Chitosan
- Chitin-Glucan
- Listed in 27 CFR 24.250
Lysovin is a powdered lysozyme that is used to control or inhibit lactic acid bacteria including Oenococcus spp., Pedococcus spp. and Lactobacillus spp. at any stage of winemaking. The enzymatic activity of lysozyme can degrade the cell walls of gram-positive bacteria (LAB) but not gram-negative bacteria (Acetobacter spp.) or yeast. Lysozyme’s effectiveness depends on the type of bacteria and the number of cells present. Recommended Lysovin contact time is seven days, after which time wine should be removed from lysozyme being racked. In red wines, Lysovin will interact with tannins rendering it inactive. In white wines Lysovin should be removed with bentonite.

Lysovin Applications | Lysovin Dose | Timing of Addition
---|---|---
Inhibit Growth of LAB in Must and Juice | 200 ppm | Add prior to fermentation
Inhibit spoilage characters due to uncontrolled microbial growth. This is especially important in high pH conditions or with grapes containing rot | 25–40 g/BL | Add at first signs of a stuck fermentation
Protection During Stuck/Sluggish Fermentations | 250–400 ppm | Add at juice stage or immediately after alcoholic fermentation
Lysovin can be used at any stage of winemaking, even if maceration or aging; allow for implantation of selected bacteria; delay MLF to increase efficiency of Phase I microbiology. Recommended Lysovin contact time is seven days, after which time wine should be removed from lysozyme being racked. In red wines, Lysovin will interact with tannins rendering it inactive. In white wines Lysovin should be removed with bentonite.

Bactiless™ is a 100% natural, non-allergic source of chitin-glucan and chitosan from a non-GMO strain of Aspergillus niger. Bactiless helps protect wine from acetic acid and lactic acid spoilage bacteria. Bactiless can be used to drastically reduce bacteria populations and to help prevent bacterial growth in wines, especially after malolactic fermentation. It offers an interesting alternative to lysozyme treatment and/or significant amounts of SO₂. The effectiveness of Bactiless can be enhanced with SO₂, but it does not replace the use of SO₂ since it does not have antioxidant or antifungal properties. Bactiless can help inhibit malolactic fermentation when it is not desired. In wines where malolactic fermentation is desired, Bactiless should not be used until after MLF is complete. Bactiless is shown to be effective against a broad spectrum of wine bacteria, but does not affect yeast populations.

Recommended Dosage | Usage
---|---
200–500 ppm | 20–50 g/BL | 1.67–4.16 lb/1000 gal | 45–113 g/60 gallon barrel

Usage | Storage | Date expiration. Store in a dry, odor-free environment below 25°C (77°F).
---|---|---
Store in dry form for 5–10 years at 18°C (65°F). Once rehydrated, Lysovin should be used immediately. Warning: In the case of low color potential grapes such as Pinot noir, caution is needed when adding Lysovin prior to completion of alcoholic fermentation (See FAQ for more details). If spoilage yeasts such as Brettanomyces are suspected, SO₂ addition should not be delayed. Lysovin is only effective against gram-positive bacteria and has no effect on yeast or gram-negative bacteria.

Bacterium spp. control agent

Recommended Dosage | Usage | Storage
---|---|---
1 kg | 40–80 ppm | 4–8 g/BL | 0.33–0.67 lb/1000 gal | 9–18 g/60 gallon barrel

Note: This product contains ingredient(s) currently listed by the TTB as acceptable in good commercial winemaking practices in 27 CFR 24.250. For more information please visit www.TTB.gov.

VErification OF NO BRETT INSIDE EFFECT ON BRETTANOMYCES

Before | After
---|---
Scanning Electron Micrograph x 20,000 magnification Brettanomyces cells prior to being treated with No Brett Inside. Images courtesy of Biljana Petrova and Dr. Charles G. Edwards, Washington State University, Pullman, WA.

Note: This product contains ingredient(s) currently listed by the TTB as acceptable in good commercial winemaking practices in 27 CFR 24.250. For more information please visit www.TTB.gov.

IMPACT OF BACTILESS ON SIX DIFFERENT ORGANISMS 30 DAYS AFTER TREATMENT

<table>
<thead>
<tr>
<th>Acetic acid bacteria (cell/mL)</th>
<th>Lactobacillus brevis (cell/mL)</th>
<th>Lactobacillus plantarum (cell/mL)</th>
<th>Lactobacillus kefyr (cell/mL)</th>
<th>Oenococcus oeni (cell/mL)</th>
<th>Pedococcus species (cell/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Bactiless at 20 g/BL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.013x10⁶</td>
<td>54,880</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35,733</td>
<td>1,010</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59,533</td>
<td>4,367</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>313</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.731x10⁶</td>
<td>40,667</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700,013</td>
<td>2,700</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trials conducted by ETS Laboratories, St. Helena, California. Trial results are the average of three replicates.
SULFUR DIOXIDE AND TARTRIC ACID

Wine quality can be preserved with sulfur dioxide (SO₂) and is used for its antioxidant and antimicrobial properties. The effectiveness of SO₂ as an antimicrobial agent is dependent upon pH as well as the presence of other SO₂-binding compounds. As pH increases, the portion of sulfur dioxide that is active against microorganisms decreases. Therefore, increases in pH require the addition of more SO₂ to maintain adequate antimicrobial activity. Inodose Granules and Tablets are an easy and effective way to add SO₂ to grapes, juice or wine.

INODOSE GRANULES
Effervescent sulfur dioxide granules

| #15776 | 100 g | $11.00 |
| #15776 | 400 g | $22.00 |

Note: Volume discounts are available. Please contact us for details.

Inodose Granules are small, effervescent granules made of potassium metabisulfite and potassium bicarbonate. As they dissolve the granule release a precise dose of SO₂. Inodose granules are packaged in pre-measured 100 g and 400 g packs. Inodose granules are perfect for adding SO₂ additions to incoming must, juice, and wines prior to clarification and fining. The potassium bicarbonate in these granules has little or no effect on pH.

INODOSE TABLETS
Effervescent sulfur dioxide tablets

| #15775 | 2 g (48/bac) | $36.00 |
| #15776 | 5 g (42/bac) | $40.00 |

Note: Volume discounts are available. Please contact us for details.

Inodose Tablets are a blend of potassium metabisulfite and potassium bicarbonate. They are packaged in 2 g and 5 g dosage levels. As they dissolve into must or wine, the tablets release a precise dose of SO₂. The effervescent action of the bicarbonate provides mixing in barrels or small tanks while reducing time and labor needed for stirring. The easy-to-use tablet helps prevent overdose problems associated with traditional forms of SO₂. Sealed strip packages keep unused tablets fresh for optimal efficacy. The potassium bicarbonate fraction in these tablets has little or no effect on pH.

POTASSIUM METABISULFITE

Potassium metabisulfite can be used throughout the wine-making process from grape receipt to finished wine.

TARTARIC ACID

Used to correct tartaric acid deficiencies, to decrease the pH and increase the titratable acidity of grapes, juice and wine thereby enhancing microbial stability, wine color and flavor.

Inodose Granules and Tablets Conversion Chart— PPM of Total Sulfur Dioxide

<table>
<thead>
<tr>
<th>#</th>
<th>1 Liter</th>
<th>1 gallon</th>
<th>6 Gallon</th>
<th>100 Gallon</th>
<th>1000 Gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 g</td>
<td>2.000</td>
<td>529</td>
<td>9</td>
<td>5</td>
<td>0.5</td>
</tr>
<tr>
<td>5 g</td>
<td>5.000</td>
<td>1,321</td>
<td>22</td>
<td>13</td>
<td>1.3</td>
</tr>
<tr>
<td>100 g</td>
<td>100,000</td>
<td>26,420</td>
<td>440</td>
<td>264</td>
<td>26.4</td>
</tr>
<tr>
<td>400 g</td>
<td>400,000</td>
<td>105,680</td>
<td>1,741</td>
<td>1,057</td>
<td>106</td>
</tr>
</tbody>
</table>

Note: The SO₂ products contain equivalent dose of pure SO₂ when added to the wine, measured as total SO₂. These products are blends of potassium metabisulfite and potassium bicarbonate and weigh more than 2.5 g, etc.

FREQUENTLY ASKED QUESTIONS: MICRONUTRIENT

LYSOZYME

How long does it take for lypozyme to work?
The rate of activity depends on many factors including temperature, pH, bacterial load, bacterial resistance and the specific matrix of any given wine. Even though lypozyme starts working immediately, it doesn’t necessarily kill all the bacteria immediately. If lypozyme-treated wine samples are plated too quickly after treatment, results may show a false-positive. To ensure accurate results, wait one week before culturing for microbes.

Is lypozyme effective against all lactic acid bacteria?
No. Some lactic acid bacteria strains show resistance to lypozyme. Bench trials MUST be performed to accurately determine the effectiveness and correct addition rate of lypozyme for your wine.

How soon after a lypozyme addition can I bottle?
Wait at least one week, even if you have diligently completed your lab trials. Lypozyme is a protein and may produce less (especially in reds) and affect the protein stability in whites. It is not recommended to bottle white wines that contain residual lypozyme.

Will lypozyme treatment affect the color of red wines?
Lypozyme added to red must can bind with tannins and other polyphenols that otherwise would have stabilized anthocyanins. This tannin loss can result in reduced color. In general, using 100–200 ppm should not cause a visually observed decrease in color. Lypozyme added post-MLF for microbial stability during barrel aging may have positive color effects when compared to stabilization with SO₂. Any decrease in color should occur in the first few days of treatment. For low color potential grapes (e.g. Pinot noir) lypozyme should be added with extreme care before alcoholic fermentation is complete, however, the consequences of adding lypozyme versus not doing so must be heavily weighed. Bench trials are critical.

SULFUR DIOXIDE

Can I use a partial bag of Inodose granules?
No. Use the entire packet for a single dose of SO₂. The formulation (therefore dosage) can be affected if the granules absorb any moisture.

Can I break the Inodose tablets in half to deliver a smaller dose?
No. Do not break the tablets for smaller dose additions. The combination of potassium metabisulfite and potassium bicarbonate may not be evenly distributed in the tablet. The tablets are available in two sizes to help give dosing choices.

I added a 5 g tablet of SO₂ to my 60 gallon barrel. Does this mean I have 22 ppm of free SO₂?
You will have 22 ppm total SO₂ added. The amount of free SO₂ depends on pH, residual sugar, solids, etc.

FREQUENTLY ASKED QUESTIONS: MICROBIAL CONTROL

BACTLESS

Do I have to rack my wines after 10 days?
Yes.

Can I just add Bactiless to the top of my vessels?
No. A thorough mixing is essential.

Does Bactiless have an impact on yeast?
Bactiless has no impact on S. cerevisiae. It can have a minimal impact on Brettanomyces, but it is not as effective as No Brett Inside. It is possible that some yeast can be caught up in the chitin-glucan matrix but this is not the best use of the product and it may not be reproducible.

Can I induce malolactic after a Bactiless addition?
This is still to be determined, however, it is highly advisable to wait until malolactic fermentation is complete before using Bactiless. If you have a lactic acid bacteria issue prior to inducing MLF you may wish to consider the use of lypozyme.

Does Bactiless impact wine sensory character?
Bactiless is neutral with regards to its sensory impact; however, it does not have the ability to remove any negative sensory compounds that may have been produced by bacterial contaminants prior to treatment.

Can Bactiless or No Brett Inside be used if I am exporting?
These products are currently approved by the TTB for use in domestic winemaking (27 CFR 24.250) and cannot be used in wines destined for export (even if it is permitted for use in the country that you are exporting to).

NO BRETT INSIDE

Do I have to rack off the No Brett Inside lesions after 10 days?
Yes.

Can I just add No Brett Inside to the top of my vessel?
No. A thorough mixing is essential.

Can I induce malolactic fermentation after a No Brett Inside addition?
This is still to be determined, however, it is highly advisable to wait until malolactic fermentation is complete before using No Brett Inside.

Does No Brett inside impact the sensory of the wines?
No Brett Inside is insoluble so it should not impact wine sensory. This also means that it will not remove any of the sensory compounds that may already be present due to a Brettanomyces infection (4-ethylphenol and 4-ethylguaiacol).

What is the difference between Bactiless and No Brett Inside?
No Brett Inside is chitosan and Bactiless is chitin-glucan.

The source is the same (Apergillus Niger), but the formulations are different. They are active in controlling different contaminants prior to treatment.

Does No Brett Inside impact the sensory of the wine?
No Brett Inside is insoluble so it should not impact wine sensory.
FINING AND STABILITY

Fining and stabilizing are complementary actions that remediate and protect juice and wine from off-odors, off-colors, and unsightly hazes and precipitates. Fining removes unwanted elements from juice and wine by physical removal. Though fining agents work by different mechanisms, they all react with or adsorb unwanted substances that are then removed by racking, filtration, centrifugation, or other means. Stabilizers react with substances to prevent wine hazes and precipitates from occurring. A properly fined, stabilized, and filtered wine ultimately leads to a bottle-stable wine.

SELECTING FINING & STABILITY AGENTS FOR SUCCESS

To properly select appropriate fining and stabilizing agents many considerations must be taken into account. First identify the fining or stability goal and then choose a treatment appropriate for the stage of winemaking. Early, proactive treatments are always recommended. Treating problems now can avoid compounded problems later.

BROWNING & OXIDATION

Grape juice and wine can oxidize leading to unwanted visual, sensory, and chemical changes. Conditions leading to browning and oxidation are not always understood, but treating problems early is always encouraged. Early fining with activated carbon and P/PVPP/Casein products can help remove oxidized phenolics and brown pigments in both the juice and wine phase.

CLARIFICATION

High solids can be problematic. Solids removal can be achieved using enzymes, gelatin, P/PVPP, bentonite, and casein. These options can be used pre- and post-fermentation. Post-fermentation isinglass can be used to reduce turbidity due to polysaccharides and colloids thereby eliminating multiple filtration steps.

HAZE

Haze can be caused by many things: microbes, heat unstable proteins, tannates, residual fining aids, etc. Protein instability can be remedied by using bentonite and residual fining aids can be removed by Hot Mix Sparkolloid and silica gels like Gelcolit. Microbial hazes can be reduced via fining and filtration. Microbial stability can also be achieved through appropriate used of microbial control agents (see pgs 87-91).

TARTRATE INSTABILITY

Preventing tartrate precipitation in a finished wine can be achieved in a number of ways. Traditionally, tannins are seeded with potassium bitartrate and chilled close to freezing temperatures to induce tartrate precipitation before bottling. Recent advances include adding tartrate inhibitors like mannoproteins and gums. Arabic. These products work by inhibiting tartrate crystal formation, thereby keeping tartrates in solution.

SENSORY ASPECTS

Wines with perceived astringency and bitterness may be improved with the use of gelatin or other protein-based products that complex with polyphenols. When the goal is to improve aromatic profiles, products like isinglass (pg 103), tannins (see pgs 68-74) as well as gelatins (pg 100) are useful.

ALWAYS CONSIDER THE FOLLOWING FACTORS WHEN CHOOSING OR APPLYING A FINING OR STABILIZING AGENT:

Fining/stability agent preparation
Most dry agents should be prepared in water. Always read product directions and follow accordingly.

Dosage
Bench trials must be conducted on each wine to determine proper dose rate.

Contact time
Most agents react rapidly when contact is made, but may need time to settle out.

Shape and size of vessel
Vessel type may impact settling time.

Temperature
Temperature impacts wine characteristics. Both high and low temperatures can inhibit sedimentation.

Winemaking stage
Previous treatments may interfere with downstream treatments.

Addition method
Pumping using a Venturi is an efficient way to disperse agents. Closed circulation after addition is also beneficial.

CHOOSEING FINING & STABILITY AGENTS

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Highly Recommended
Recommended

93 94
**Fining & Stability**

- **Granucol FA**
  - Decolorizing carbon
  - White, Red, Rosé
  - Usage: Juice, Wine
  - Dosage: 100–1000 ppm; 10–100 g/hL; 0.83–8.3 lb/1000 gal
  - Contact Time: 24 hours
  - Impact: Removes color

- **Granucol GE**
  - Decolorizing carbon
  - White, Red, Rosé
  - Usage: Juice, Wine
  - Dosage: 100–1000 ppm; 10–100 g/hL; 0.83–8.3 lb/1000 gal
  - Contact Time: 24 hours
  - Impact: Removes off-odors and flavors

- **Blancobent UF**
  - Bentonite for use during crossflow filtration
  - White, Red, Rosé
  - Usage: Juice, Wine
  - Dosage: 25 kg; $118.00
  - Contact Time: 1 hour
  - Impact: Removes proteins

- **FermoBent® PORE-TEC**
  - Bentonite for use during fermentation
  - White, Rosé
  - Usage: Juice, Wine
  - Dosage: 8.4–16.8 lb/1000 gal
  - Contact Time: 24 hours
  - Impact: Removes proteins

Granucol FA is a decolorizing carbon for the elimination of off-colors due to browning in juice and wine. These activated carbon pellets are prepared for ease of use in the cellar.

Granucol GE is a deodorizing carbon for the absorption of off-tastes and off-odors. These activated carbon pellets are prepared for ease of use in the cellar.

Blancobent UF is a highly purified and particularly effective powdered sodium-calcium bentonite formulated for use in conjunction with crossflow filtration. Due to the preparation of the bentonite and the absence of particles >100 µm, Blancobent UF does not cause excessive abrasion to crossflow membranes. Owing to its defined particle size distribution, it is compatible with direct dosing into hollow fiber membrane crossflow systems. In this way, filtration and stabilization happen in one step!

Bentonite is aluminum silicate clay which is mined in several areas around the world. The wine industry uses two types of bentonites, considered to be some of the highest quality bentonite in the world. White, red, and rosé wines. Sodium-based bentonites are better at protein removal. Its lattice structure readily separates in water, exposing negative charges that adsorb and trap positively charged proteins. Calcium bentonite is gentler. Its structure does not separate as easily in water, it flocculates faster, and forms a more compact sediment.

The stronger the positive charge of the protein, the more reactive it is with bentonite. At lower pH, protein has a stronger charge. At higher pH, the protein charge is weaker so the more potent sodium-calcium bentonite is recommended. In addition to protein removal, bentonite can also be used as a counter-fining and clarifying agent in conjunction with positively charged fining agents (e.g., gelatin, singlass, etc.). Bentonite is also used in sparkling winemaking as an adjuvant to help riddling.

The quality of bentonite determines its effectiveness. The most refined bentonites are lighter in color with no or very low levels of sand and grit. We're happy to offer Erbslöh bentonites, considered to be some of the highest quality bentonite in the world.

For successful bentonite preparation: Hard water or acidic water makes swelling less effective as it inhibits cation exchange. Pay close attention to swelling times. If bentonite is not swelled as recommended its efficacy will be reduced. The longer the swelling time, the greater the adsorption area. Ensure that bentonite has not picked up any off-odors prior to use.

Note for successful bentonite preparation: Hard water or acidic water makes swelling less effective as it inhibits cation exchange. Pay close attention to swelling times. If bentonite is not swelled as recommended its efficacy will be reduced. The longer the swelling time, the greater the adsorption area. Ensure that bentonite has not picked up any off-odors prior to use.

**Granucol GE**

- Usage: Juice, Wine
- Dosage: 100–1000 ppm; 10–100 g/hL; 0.83–8.3 lb/1000 gal
- Contact Time: 24 hours
- Impact: Removes off-odors and flavors

**Blancobent UF**

- Usage: Juice, Wine
- Dosage: 25 kg; $118.00
- Contact Time: 1 hour
- Impact: Removes proteins

**FermoBent® PORE-TEC**

- Usage: Juice, Wine
- Dosage: 8.4–16.8 lb/1000 gal
- Contact Time: 24 hours
- Impact: Removes proteins

**Granucol FA**

- Usage: Juice, Wine
- Dosage: 100–1000 ppm; 10–100 g/hL; 0.83–8.3 lb/1000 gal
- Contact Time: 24 hours
- Impact: Removes color

**Granucol GE**

- Usage: Juice, Wine
- Dosage: 100–1000 ppm; 10–100 g/hL; 0.83–8.3 lb/1000 gal
- Contact Time: 24 hours
- Impact: Removes off-odors and flavors
**Granuent PORE-TEC**

Granuent PORE-TEC is a highly purified sodium-based bentonite for the removal of heat unstable proteins in juice and wine. Its refined, granular formation is produced using PORE-TEC technology, making it almost dust-free and easy to use.

**Dosage**

Bench trials recommended for wine

<table>
<thead>
<tr>
<th>Usage</th>
<th>Dosage</th>
<th>Usage</th>
<th>Storage</th>
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<tbody>
<tr>
<td>Juice</td>
<td>200–1500 ppm</td>
<td>Wine</td>
<td>20–100 g/L</td>
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<td>1–7 days</td>
<td>20–150 g/L</td>
<td>1.7–12.6 lb/1000 gal</td>
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**Nacalit PORE-TEC**

Nacalit® PORE-TEC is a granulated sodium and calcium bentonite that is specifically formulated for instances where superior flocculation, adsorption and clarification are required.

**Dosage**

Bench trials recommended for wine

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<tr>
<th>Usage</th>
<th>Dosage</th>
<th>Usage</th>
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<tbody>
<tr>
<td>Juice</td>
<td>50–1500 ppm</td>
<td>Wine</td>
<td>20–100 g/L</td>
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<tr>
<td>1–7 days</td>
<td>20–150 g/L</td>
<td>1.7–12.6 lb/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Bentolact S**

Bentolact S is a proprietary IOC blend of soluble casein and bentonite. It is most effective when used early in the winemaking process to clean-up moldy fruit, remove bitter characters, assist with clarification and help remove volatile sulfur off-odors.

**Dosage**

Bench trials recommended for wine

<table>
<thead>
<tr>
<th>Usage</th>
<th>Dosage</th>
<th>Usage</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice</td>
<td>200–1000 ppm</td>
<td>Wine</td>
<td>20–100 g/L</td>
</tr>
<tr>
<td>1–2 weeks</td>
<td>20–100 g/L</td>
<td>1.7–1.8 lb/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Caséinate de Potassium**

Caséinate de Potassium is used in both juice and wines for the treatment of oxidized phenolics and bitter compounds. It helps freshen wine and remove musty aromas. Although the potassium helps with solubility, once added a thorough mixing is essential.

**Dosage**

Bench trials recommended for wine

<table>
<thead>
<tr>
<th>Usage</th>
<th>Dosage</th>
<th>Usage</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice</td>
<td>500–1000 ppm</td>
<td>Wine</td>
<td>20–100 g/L</td>
</tr>
<tr>
<td>1–2 weeks</td>
<td>20–100 g/L</td>
<td>1.7–1.8 lb/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>

**Freshprotect**

Freshprotect is a proprietary IOC blend of polyvinylpolypyrrolidone (PVPP), bentonite, cellulose and gum arabic. It is used to remove oxidized characters, bitterness and herbaceousness in both juice and wines. It is especially useful in the treatment of hard-press wine where it reduces aggressiveness and reveals fruit. Freshprotect must be removed from wine via filtration per TTB regulations due to the PVPP.

**Dosage**

Bench trials recommended for wine

<table>
<thead>
<tr>
<th>Usage</th>
<th>Dosage</th>
<th>Usage</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juice</td>
<td>200–1000 ppm</td>
<td>Wine</td>
<td>20–100 g/L</td>
</tr>
<tr>
<td>1–2 weeks</td>
<td>20–100 g/L</td>
<td>1.7–1.8 lb/1000 gal</td>
<td></td>
</tr>
</tbody>
</table>
Polycel is an IOC blend of polyvinylpolypyrrolidone (PVPP) and cellulose formulated to help prevent and/or treat compounds associated with browning and pinking. It can also be used to treat bitterness and herbaceousness. As Polycel can bind color molecules and catechins it is best to use in young wines. Polycel must be removed from wine via filtration per TTB regulations due to the PVPP.

Dosage
Bench trials recommended for wine

300–700 ppm
Dissolve Polycel in approximately 20 times its weight of cool water. Mix well and allow to sit for 2 hours. Add the mixture into the tank slowly; making sure the addition is thoroughly blended into the juice or wine being treated. This is important as the casein portion can float.

Usage
Dissolve Polycel in approximately 20 times its weight of cool water. Mix well and allow to sit for 1 hour. Add mixture to the tank slowly, making sure the addition is thoroughly blended into the juice or wine being treated. Depending upon the wine, Polycel may take up to a week to settle out. PVPP is intended as a processing aid.

Storage
Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Stage of Winemaking: Cold settling for juice, pre-bentonite addition for wine
Contact Time: 1-2 weeks
Impact: Treatment of oxidation, unmasking of aromas

Stage of Winemaking: Cold settling for juice, young wines post early racking
Contact Time: 1-2 weeks
Impact: Oxidation control, removal of bitter compounds

Colle Perle is a hydrolysed gelatin solution which can be used for clarification as well as for the treatment of astringency in wines. Colle Perle flocculates and settles well. It is particularly useful for hard pressed wines.

Dosage
Bench trials recommended for wine

300–600 ppm
Add at the beginning of cold settling and mix thoroughly to ensure even distribution. When used in juice Colle Perle should be used in conjunction with bentonite or Gelocolle to improve settling. Racking should be done after 1 week.

Wine
Add and mix vigorously into the wine to ensure thorough distribution. Racking should be done after 1 week. Filtration is possible 48-72 hours after fining with Colle Perle. This is when filtration is most productive. For wines intended for aging, a second racking 1 week after treating with Inocolle. This is when filtration is most productive. For wines intended for aging, a second racking 1 week after the first racking will produce the best results.

It is not recommended to leave gelatins in wine for more than 30 days.

Storage
Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Stage of Winemaking: Cold settling for juice, pre-bentonite addition for wine
Contact Time: 1 week
Impact: Clarification, removal of astringent compounds

Inocolle is a partially hydrolysed gelatin solution that softens wine while improving aromas and flavors. It can help clarify wine by removing both colloidal and unstable materials.

Dosage
Bench trials recommended for wine

500–1000 ppm
Dilute Inocolle 1:1 in water. Introduce into juice gradually while mixing vigorously to assure even treatment. Racking should be done after 1 week. Dilute Colle Perle 1:1 in water. Introduce into wine 1 hour before adding Gelocolle. Mix vigorously to assure even treatment. Racking should be done after 1 week. Filtration is possible 48-72 hours after treating with Inocolle. This is when filtration is most productive. For wines intended for aging, a second racking 1 week after the first racking will produce the best results.

It is not recommended to leave gelatin in wine for more than 30 days.

Storage
Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Stage of Winemaking: Cold settling for juice, pre-bentonite addition for wine
Contact Time: 1 week
Impact: Clarification and aroma revelation
## INACTIVATED YEAST & BENTONITE BLENDS

### PURE-LEES LONGEVITY ™

**Gentle fining and oxygen scavenging, compatible with low SO₂ winemaking**

| Stage of Winemaking: Post-fermentation | Contact Time: 1-2 weeks | Impact: Stabilization through lees deposition |

Pure-Lees Longevity ™ is a proprietary blend of inactivated yeast and bentonite used to scavenge dissolved oxygen during aging, cold (tartaric) stabilization and transportation. Pure-Lees Longevity ™ is the result of work done in collaboration with INRA with different inactivated yeast fractions to evaluate their impact on oxidation. The result is a product with high dissolved oxygen uptake capacity. Oxidation can be responsible for loss of fruit character, browning of wine and decreased shelf-life.

Using Pure-Lees Longevity ™ helps protect color and aromas. Although research determined it was more efficient than SO₂ at preserving color and thiols during 5-month aging trials, it is not a substitute for SO₂ as it has no antimicrobial activity. Reduces sulfur off-aromas; OMRI listed

**Dosage**

<table>
<thead>
<tr>
<th>Bench trials recommended for wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>200–1000 ppm</td>
</tr>
</tbody>
</table>

**Usage**

Suspend Pure-Lees Longevity ™ in 10 times its weight of water, then add to wine. Mix thoroughly. Contact time depends on aging time (1–9 months).

**Storage**

Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packing immediately.

**Impact:**

- Helps chelate proteins and other compounds.
- Reduces sulfur off-aromas; OMRI listed

### GELOCOLLE ®

**Silica gel for improved settling**

Red, White, Rosé, Fruit, Cider

| Stage of Winemaking: Wine fining | Contact Time: 1–3 days | Impact: Reduction of sulfur off-odors |

Gelocolle is an aqueous solution of suspended silica commonly used in conjunction with gelatins, isinglass and other organic (protein-based) fining agents. It initiates flocculation of fining agents and helps lees compaction. It also reduces the risk of leaving residual protein-based fining agent behind (overfining). Gelocolle can be used for hard-to-filter wines where it helps chelate proteins and other compounds.

**Dosage**

<table>
<thead>
<tr>
<th>Bench trials recommended for wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>200–1000 ppm</td>
</tr>
</tbody>
</table>

**Usage**

Gelocolle should be added directly into wine 1 hour after addition of protein-based fining agents (gelatin, isinglass, etc.) Mix thoroughly.

**Storage**

Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packing immediately.

**Impact:**

- Helps chelate proteins and other compounds.
- Reduces sulfur off-aromas; OMRI listed

### REDULESS ™

**Reduces sulfur off-aromas; OMRI listed**

Red, White, Rosé, Cider

| Stage of Winemaking: Wine fining | Contact Time: 1–9 months | Impact: Scaevenges oxygen |

Redules® ™ is a unique fining product used to reduce sulfur off-odors such as H₂S and dimethyl sulfide. Its formulation includes bentonite together with other natural elements which are rich in copper. Redules can naturally enhance roundness literally, of course, or you might smell yeasty). Redules attacks sulfur compounds and helps lees compaction.

**Dosage**

<table>
<thead>
<tr>
<th>Bench trials recommended for wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>200–150 ppm</td>
</tr>
</tbody>
</table>

**Usage**

Mix Redules in 10 times its weight of water. Add immediately to the tank. If prepared in advance, re-suspend the product prior to its addition to the tank. Gently mix and rack off or filter after 72 hours. The maximum potential copper transfer, when used according to the recommendation, is 0.02 ppm.

**Dated expiration.** Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

**Impact:**

- Helps chelate proteins and other compounds.
- Reduces sulfur off-aromas; OMRI listed

---

### INERT CLARIFYING AGENTS

### HOT MIX SPARKOLLOID ®

**Hot for scavenging**

Red, White, Rosé, Fruit, Cider

| Stage of Winemaking: Wine clarification | Contact Time: 1–2 weeks | Impact: Lees compaction |

Hot Mix Sparkoloid® is specially formulated to clarify wine without impacting aroma, body or flavor. It can be used after bentonite or carbon fines to help compact lees. Hot Mix Sparkoloid can be helpful in removing haze left by other fining agents and enhances filterability.

**Dosage**

<table>
<thead>
<tr>
<th>Bench trials recommended for wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>125–500 ppm</td>
</tr>
</tbody>
</table>

**Usage**

Heat water to boiling [1–2 gallons of water per pound Hot Mix Sparkoloid (6–15 kg)]. Slowly stir in the Hot Mix Sparkoloid. Maintain temperature above 82°C (180°F) while agitating the mixture constantly until all of the translucent globules of clarifier have been dissolved and the mixture is smooth and creamy (approximately 20–30 minutes). While still hot, slowly add the mixture to the wine. This is easily accomplished by adding to a tank being mixed by a tank agitator or by introducing the hot mixture into the line during a tank circulation. Let the wine settle 1 week or more, depending somewhat on the volume of wine involved. Then filter, preferably from the top of the tank.

**Storage**

Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

**Impact:**

- Lees compaction, filterability enhancement

---

### HOT MIX SPARKOLLOID ®

**Comes hot for scavenging**

Red, White, Rosé, Fruit, Cider

| Stage of Winemaking: Wine clarification | Contact Time: 1–2 weeks | Impact: Lees compaction, filterability enhancement |

**Dosage**

<table>
<thead>
<tr>
<th>Bench trials recommended for wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>125–500 ppm</td>
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**Usage**

Heat water to boiling [1–2 gallons of water per pound Hot Mix Sparkoloid (6–15 kg)]. Slowly stir in the Hot Mix Sparkoloid. Maintain temperature above 82°C (180°F) while agitating the mixture constantly until all of the translucent globules of clarifier have been dissolved and the mixture is smooth and creamy (approximately 20–30 minutes). While still hot, slowly add the mixture to the wine. This is easily accomplished by adding to a tank being mixed by a tank agitator or by introducing the hot mixture into the line during a tank circulation. Let the wine settle 1 week or more, depending somewhat on the volume of wine involved. Then filter, preferably from the top of the tank.

**Storage**

Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

**Impact:**

- Lees compaction, filterability enhancement
Cristellar® is a specialty liquid mannoprotein product from Oenosbrands to aid in the natural tartaric stabilization of wines. It is the result of a patented extraction and separation technique, that isolates the fraction of mannoproteins from S. cerevisiae with the highest Tartrate Stability Index (TSI). When added to wine, Claristar inhibits the nucleation and growth of potassium tartrate crystals. In addition to improved stability, the sensory characteristics of the wine, Claristar inhibits the formation of potassium tartrate stabilization, White, Rosé, Red

<table>
<thead>
<tr>
<th>Claristar®</th>
<th>Natural liquid mannoprotein preparation for potassium tartaric stabilization</th>
<th>White, Rosé, Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>#17000</td>
<td>2.5 L</td>
<td>$204.00</td>
</tr>
<tr>
<td>#17001</td>
<td>20 L</td>
<td>$1436.00</td>
</tr>
</tbody>
</table>

Claristar can be considered for use in white, rosé and red wines that meet the below criteria:

- Are the final blend
- Have never been pH adjusted with calcium carbonate
- Are confirmed protein stable
- Are under 16% alcohol by volume

Claristar should never be added to a wine prior to cake/DE/bentonite addition or sterile cartridge filtration. The wine submitted for bench trials MUST be the final blend. Claristar should be the final addition to any wine prior to filtration and bottling. Contact Scott Laboratories, Inc. for more information regarding the bench trial requirement.

Usage:
- Contact Time: 2-4 weeks
- Impact: Clarification, brightening and aroma revealing

Dosage:
- Stage of Winemaking: Pre-bentonite addition
- Contact Time: 2-4 weeks
- Impact: Clarification, brightening and aroma revealing

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

Impact:
- Clarification
- Brightening
- Aroma revealing

**MANNOPROTEINS AND GUM ARABICS FOR STABILITY**

**FREQUENTLY ASKED QUESTIONS: FINING & STABILITY**

**ISINGLASS**

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Colloidal protection, sweetness

- **Dosage**
  - Bench trials recommended for wine
  - Stage of Winemaking: Pre-bottling
  - Contact Time: 24-72 hours
  - Impact: Colloidal protection, sweetness

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

**FLAS Gum arabic for colloidal protection**

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

- **Dosage**
  - Bench trials recommended for wine
  - Stage of Winemaking: Pre-bottling
  - Contact Time: 24-72 hours
  - Impact: Colloidal protection, sweetness

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

- **Gum arabic for colloidal protection**
  - **Usage**
    - Contact Time: Indefinitely
    - Impact: Brightening and red wines that meet the below criteria:

- **Dosage**
  - Stage of Winemaking: Pre-bottling
  - Contact Time: 24-72 hours
  - Impact: Colloidal protection, sweetness

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

Impact:
- Clarification
- Brightening
- Aroma revealing

**LINGESS**

- **Dosage**
  - Stage of Winemaking: Pre-bottling
  - Contact Time: 24-72 hours
  - Impact: Colloidal protection, sweetness

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

Impact:
- Clarification
- Brightening
- Aroma revealing

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

Impact:
- Clarification
- Brightening
- Aroma revealing

**LINGESS**

- **Dosage**
  - Stage of Winemaking: Pre-bottling
  - Contact Time: 24-72 hours
  - Impact: Colloidal protection, sweetness

- **Usage**
  - Contact Time: Indefinitely
  - Impact: Balancing and softening

Storage:
- Indefinitely
- Dated expiration. Store in a dry, odor-free environment at or below 25°C (77°F).

Impact:
- Clarification
- Brightening
- Aroma revealing

Do I need to run bench trials before I use a fining agent?

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Do I need to run bench trials before I use a fining agent?
CLEANING

BENEFITS OF AIRD® PRODUCTS

- Specially formulated products for the wine industry
- Significant water savings — no citric rinse is required
- Non-dusting product

- Innovative BUILT FORMULA for more effective cleaning
- Effective at low doses over wide temperature ranges
- Safer and lower environmental impact than bulk chemical cleaners
- No chlorine, other halogens, phosphates, silicates or fillers

WATER SAVINGS WITH AIRD PRODUCTS

<table>
<thead>
<tr>
<th>AIRD Process</th>
<th>Water Used*</th>
<th>Classic Method</th>
<th>Water Used*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rinse</td>
<td>100 gallons</td>
<td>100 gallons</td>
<td></td>
</tr>
<tr>
<td>AIRD Product</td>
<td>200 gallons</td>
<td>200 gallons</td>
<td>200 gallons</td>
</tr>
<tr>
<td>Short Rinse</td>
<td>100 gallons</td>
<td>200 gallons</td>
<td>200 gallons</td>
</tr>
<tr>
<td>TOTAL</td>
<td>400 gallons</td>
<td>200 gallons</td>
<td>400 gallons</td>
</tr>
</tbody>
</table>

The chart shows a common cleaning procedure for a 2,000 gallon tank cleaning. *Not including potential reuse of AIRD solutions. Actual water savings may be greater.

CHOOSING CLEANING PRODUCTS FOR SUCCESS

- Highly recommended
- Not recommended

Cleaning Agents

<table>
<thead>
<tr>
<th></th>
<th>Dow Corning</th>
<th>Destainex-LF</th>
<th>Oak Restorer</th>
<th>Oak Restorer-HW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dosage</strong></td>
<td>10–40 g/L</td>
<td>1–3.5 oz/gal</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Oak Restorer products are proprietary cleaners formulated for use on oak surfaces. These products were developed on behalf of winery clients in Australia. These buffered carbonate blends also contain bicarbonates and surfactants to effectively remove tartrate build-up, color, tannin and protein residues, thereby extending the working life of barrels, puncheons, redwood tanks and staves. Oak Restorers are single process cleaning agents requiring only a water rinse. No subsequent neutralization is required. Oak Restorers leave your wooden surfaces refreshed, odorless and pH neutral.

INSTRUCTIONS FOR CLEANING PRODUCTS

Consult the chart on page 105 for water temperature requirements of each product. Cleaning is most effective when soft or treated water is used. Prepare appropriate volume of potable water (typically 10% of vessel volume you are cleaning), accurately measuring the correct weight of the cleaner. Slowly add the powder into the water, mixing until a consistent solution is obtained. Initially the solution has clarified but will clarify. Once the prepared solution will appear milky, but will clarify. Once the solution has clarified it is ready for use. Products can be used manually or with automated CIP systems. Contact time is based on water temperature and quality, amount of product used and turbulence of contact.
FRUIT WINES & MEAD

Making wine from sources other than grapes can be quite different and can pose many challenges. Numerous tools used in grape fermentation can also be utilized in fruit or mead fermentation. These tools can help the winemaker create a better product and ultimately enhance product longevity. The following information has been compiled to highlight our recommendations.

CHOOSING PRODUCTS FOR FRUIT WINES AND MEAD

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Enzymes</th>
<th>Fining Agents/Stability</th>
<th>Yeast Derivative Nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go Ferm Protect Evolution™</td>
<td>Enzymes</td>
<td>Fining Agents/Stability</td>
<td>Yeast Derivative Nutrients</td>
</tr>
<tr>
<td>Scottzyme® Pec5L</td>
<td>Lalvin 71B™</td>
<td>ScottTan™ FT Rouge</td>
<td>Glutaratic™</td>
</tr>
<tr>
<td>Scottzyme® KS</td>
<td>Lalvin 27™</td>
<td>ScottTan™ FT Rouge Soft</td>
<td>Opti-RED™ Soft</td>
</tr>
<tr>
<td>Scottzyme®HC</td>
<td>Lalvin 27™</td>
<td>ScottTan™ FT Blanc</td>
<td>Scott’Tan™ FT Rouge</td>
</tr>
<tr>
<td>PN4™</td>
<td>Lalvin 27™</td>
<td>ScottTan™ FT Blanc Citrus</td>
<td>Scott’Tan™ FT Blanc Citrus</td>
</tr>
<tr>
<td>Lalvin MBR 31™</td>
<td>Lalvin 27™</td>
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</tr>
<tr>
<td>Lalvin EC1118™</td>
<td>Lalvin 27™</td>
<td>ScottTan™ ColorMax</td>
<td>Scott’Tan™ FT Blanc Soft</td>
</tr>
<tr>
<td>Lalvin K1 (V1116)™</td>
<td>Lalvin 27™</td>
<td>ScottTan™ Rouge</td>
<td>Scott’Tan™FT Blanc Soft</td>
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<td>ScottTan™ Rouge Berry</td>
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<td>ScottTan™ Rouge Red</td>
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<td>ScottTan™Rouge</td>
<td>Scott’Tan™FT Blanc Soft</td>
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<tr>
<td>Lalvin K1 (V1116)™</td>
<td>Lalvin 27™</td>
<td>ScottTan™Rouge Red</td>
<td>Scott’Tan™FT Blanc Soft</td>
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<tr>
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<td>Lalvin 27™</td>
<td>ScottTan™ Rudgece</td>
<td>Scott’Tan™FT Blanc Soft</td>
</tr>
<tr>
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<td>Lalvin 27™</td>
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BENCH TRIAL PROTOCOLS AND PROCEDURES

A bench trial is a small-scale test that simulates the effect a tannin, fining agent or other additive will have on a large volume of wine. Bench trials are used to: evaluate the efficacy of treatments, determine proper dose rate, and gain familiarity with addition methods. By working in small volumes, large volume mistakes can be avoided. Wine matrices differ for many reasons (vintage variations, winemaking practices, etc.) and bench trials must be repeated for every lot of wine.

An additive that worked last year or in a different lot, may not work again in the same way or at the same dose. Bench trials also demonstrate how an additive will behave during preparation (redistribution) or mixing. Many fining products have unique and sometimes difficult solubility issues which can pose a challenge in the cellar. Bench trials alert the winemaker to potential issues and can help formulate a more efficient plan when additions are made in the cellar.

HOW TO DO A BENCH TRIAL

1. Make sure to keep a CONTROL. A control is an untreated portion of wine.
2. Decide which dosages to prepare (100 ppm, 200 ppm and 300 ppm for example). Consult product technical information for manufacturer’s recommended dosages.
3. Prepare stock solutions. Make a 2.5%, 5% or 10% stock solution by adding 2.5, 5.0, or 10 mL product to total volume of 100 mL, respectively. Put into the graduated cylinder or volumetric flask and fill to the 100 mL mark. Additives that are liquids can also be prepared in this way by adding 2.5, 5.0, or 10 mL product to total volume of 100 mL.
4. Using either the Bench Trial Calculator (previous page) or the Cheat Sheet here, add the appropriate volume of stock solution to either 375 mL or 750 mL bottles, then fill to the proper level (evacuating the head space with gas, if possible).
5. After capping or corking, agitate gently to get a good mix. If the product is not completely soluble (e.g., Noblesse, fining agents), occasional agitation might just be as long as it takes the agent to settle. For tannins, it should be at least 15 minutes. Use a pipette to add your sample and be sure to add it to the proper level (Evacuating the head space with gas, if possible).
6. Taste and/or test after the appropriate waiting period. For fining agents, this might take several trials.

FINISHING KIT FOR BENCH TRIALS

This kit contains:

- Scott'Tan™ FT Blanc (pg 69)
- Scott'Tan™ FT Blanc Soft (pg 70)
- Scott'Tan™ FT Blanc Citrus (pg 69)
- Scott'Tan™ FT Rouge Berry (pg 71)
- Scott'Tan™ Radiance (pg 101)
- Ultima Soft (pg 104)
- Flashgum B Liquide (pg 104)
- Oak Lab™ Thermic Oak Samples, Profiles 1-5 (pg 76)
- Scott’Tan™ Riche Extra (pg 73)
- Scott’Tan™ Onyx (pg 72)
- Scott’Tan™ Radiance (pg 72)
- Scott’Tan™ Royal (pg 73)
- Reduless™ (pg 101)
- Scott’Tan™ Easys (pg 69)
- Scott’Tan™ Riche (pg 73)

Note: Tannin solutions have been prepared for ease of use in bench trials. All of our tannins are normally sold as powder or granule.
### PRODUCT STORAGE AND STABILITY GUIDELINES

<table>
<thead>
<tr>
<th>Product</th>
<th>Optimal Storage Temperature (unopened)</th>
<th>Recommended Storage (once opened)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Dried Yeast</td>
<td>20°C(68°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry, odor-free environment</td>
</tr>
<tr>
<td>Bactiless</td>
<td>Below 25°C(77°F)</td>
<td>Tightly sealed, dry, odor-free environment</td>
</tr>
<tr>
<td>Bentolact S</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry, odor-free environment</td>
</tr>
<tr>
<td>Bentonites</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry, odor-free environment</td>
</tr>
<tr>
<td>Caséinate de Potassium</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry, odor-free environment</td>
</tr>
<tr>
<td>Claristar</td>
<td>10°C(50°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Cleaning Products (AiRD)</td>
<td>10-20°C(50-68°F)</td>
<td>Tightly sealed, dry, odor-free environment, protected from light</td>
</tr>
<tr>
<td>Exotics Mosaic/Novello</td>
<td>5–15°C(41–59°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Flashgum R Liquide</td>
<td>25°C(77°F)</td>
<td>Tightly sealed</td>
</tr>
<tr>
<td>Freshprotect</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry</td>
</tr>
<tr>
<td>Gelatin (Celle Perle &amp; Inocolle)</td>
<td>25°C(77°F)</td>
<td>Tightly sealed</td>
</tr>
<tr>
<td>Gelocolle</td>
<td>10–20°C(50-68°F). Do not freeze.</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Inodose Granules &amp; Tablets</td>
<td>25°C(77°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Ionypur</td>
<td>4°C(39°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Lysovin</td>
<td>Dry: 5-10 years @ 18°C(65°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Makolastic Bacteria</td>
<td>Short term: @ 4°C(39°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>No Brett Inside</td>
<td>Below 25°C(77°F)</td>
<td>Tightly sealed, dry</td>
</tr>
<tr>
<td>Non-Saccharomyces yeast (Biodiva, Flavia, Gaia)</td>
<td>11°C(52°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Non-Saccharomyces yeast (Lakia)</td>
<td>4°C(39°F)</td>
<td>Use immediately</td>
</tr>
<tr>
<td>Nutrients- Yeast, Bacteria and Yeast Derivative Nutrients</td>
<td>18°C(65°F)</td>
<td>Tightly sealed, dry</td>
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<tr>
<td>Oak</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry</td>
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<tr>
<td>Polycacel</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry</td>
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<tr>
<td>Polycel</td>
<td>25°C(77°F)</td>
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<tr>
<td>Potassium Metabisulfite</td>
<td>25°C(77°F)</td>
<td>Use immediately</td>
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<tr>
<td>Pure-Lees Longevity Plus</td>
<td>Below 25°C(77°F)</td>
<td>Tightly sealed, dry</td>
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<tr>
<td>Hot Mix Sparkloid</td>
<td>4 years @ 18°C(65°F)</td>
<td>Tightly sealed, dry</td>
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<tr>
<td>Tannins</td>
<td>18°C(65°F)</td>
<td>Tightly sealed, dry</td>
</tr>
<tr>
<td>Tartaric Acid</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry</td>
</tr>
<tr>
<td>Ultima soft</td>
<td>25°C(77°F)</td>
<td>Tightly sealed, dry</td>
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Note: Most products have an expiration date on the package. Please check the product and store appropriately.

### HOW TO ORDER

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Our easy-to-use website makes planning and submitting your orders easier than ever. Try one, or all, of these convenient features:

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#### PDF ORDER PLANNER

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#### ORDER UPLOAD

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#### ORDER TEMPLATES

If you have groups of items that you order regularly or want to save for quick re-ordering, nothing beats our Order Templates feature. Just assemble a shopping cart by browsing the site or using any of the handy tools listed above, and from the Shopping Cart page choose “Save as Order Template.” Next time you want to start an order from this list of items you can load it from either your “My Account” section of the site, or directly from the Shopping Cart page. Great for recurring purchases.

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**CIDER + SPARKLING BOOKS**

Scott Laboratories is proud to be a trusted resource for all of your fermentation endeavors! For a copy of our Sparkling or Cider Handbook, please contact us.
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