



**Scott Laboratories
2021 Winemaking Handbook**

WELCOME: YOU HAVE A FRIEND AT SCOTT LABS

Welcome to the 2021 edition of the Scott Labs' Winemaking Handbook! Now in its 26th year, the purpose of this publication is to bring you the best fermentation and enological products while delivering the best product support and application know-how.

This handbook is just one of the ways we share our expertise and it complements the year-round, personal support provided by our team. When I wrote the introduction to the handbook last year I was excited to show off our knowledgeable and friendly team and was looking forward to a productive year.

Then the pandemic hit, fires raged, and the country became

distressed around political and societal issues. It was a tough year. We hope you're all okay.

We have really missed seeing you and seeing each other but have learned that we can maintain our connection even if we are physically distant. In that spirit, we look forward to seeing you in person or by video chat, talking with you by phone, answering your emails, and (especially) drinking your products.

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



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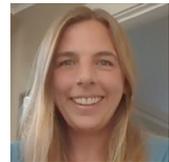
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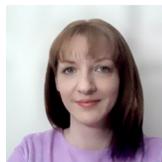
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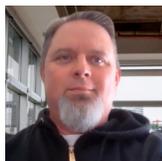
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SUPPLIERS

LALLEMAND

lallemandwine.com

Lallemand has been producing yeast since the 1920s when it started supplying fresh bakers yeast in Quebec, Canada. In 1974, over 50 years later, Lallemand found a new partner with Scott Laboratories who was looking to produce dry wine yeast from their culture collection. Two strains were produced that first year — the first ever active dry wine yeast brought to North America!

The Lallemand/Scott Laboratories relationship, now in its 47th year, has brought North American winemakers nearly one hundred Lallemand products including yeast, yeast-based products, bacteria and enzymes.

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

Lallemand Oenology 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 oenological 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.

IOC

ioc.eu.com

The origins of the Institut Oenologique de Champagne (IOC) headquartered 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.

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.

ANCHOR

anchoroenology.com

Anchor Yeast began in 1923 when Daniel Mills and Sons started the first yeast factory in Cape Town, South Africa. Yeast is now produced in an ISO 9001:2008 certified plant near Durban, South Africa. They produce wine yeast, baker's yeast, distilling yeast and whiskey yeast which are sold throughout the world.

The wine yeast strains from Anchor Oenology can be divided into natural isolates and hybrid strains which combine the best characteristics from both parents. Anchor Oenology is the leading New World wine yeast producer.

THE OAK LAB

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, consistent 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



oenobrand.com

Oenobrand comes to the Scott Laboratories portfolio with a distinguished pedigree. Supported by its world-renowned parent companies, DSM Food Specialties and Anchor Oenology, Oenobrand pro-

vides winemakers with innovative and scientifically sound solutions. This results in revolutionary products from brands such as DSM, Rapidase® and Claristar®.

ERBSLÖH

erbsloeh.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.

AIRD INNOVATIONS IN CHEMISTRY

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 vine-

yards with the goal of providing sustainable, non-hazardous alternatives to caustic for cleaning stainless steel and other surfaces.



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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 substitute for good winemaking practices or ongoing vigilance.

Please Note:

Trade of wine between the United States, Canada and other nations and/or trade blocs (such as the European Community) may involve restrictions. In particular these may involve proscription or limitation on the allowable levels of certain ingredients in fermentation aids, fining agents or stabilization products. To the best of our knowledge, all products described in this handbook when used as directed herein are legal for use in wine made in, and sold, in the United States. Conditions of trade with other nations and trade blocs are subject to ongoing change beyond the control of Scott Laboratories, Inc. It is the responsibility of users of our products to be informed of current restrictions of other countries or trade blocs to which they wish export and to use only products and product levels which conform to those restrictions.

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NEW PRODUCTS FROM



YEAST

FERMIVIN



Sweet and semi-sweet wines

FERMIVIN® SM102 is a pure strain of *Saccharomyces cerevisiae* that is used in sweet and semi-sweet wine production. Wines are well-balanced with delicate aromas and floral notes.

Find SM102 on page 25



NON-SACCHAROMYCES YEAST

INITIA™

Oxygen-scavenging yeast to protect aroma and color

LEVEL2™

INITIA™ is a pure culture of *Metschnikowia pulcherrima* that quickly consumes oxygen. When added to freshly pressed white or rosé juice INITIA can prevent browning and other damaging oxidative effects. INITIA-treated wines have fresher aromatics and brighter color. INITIA consumes oxygen faster than SO₂, making INITIA ideal for low chemical input winemaking.

Find INITIA on page 37



YEAST

LALVIN ICV



Complex, elegant rosés with red fruity notes

LALVIN ICV SUNROSE™ is a pure strain of *Saccharomyces cerevisiae* from the Institut Coopératif du Vin (ICV) that is used in rosé wine production. Wines are elegant with complex red fruit aromas. This strain is especially suitable for rosé winemaking with grapes from warm climates.

Find ICV SUNROSE on page 27



YEAST NUTRIENT

Stimula Cabernet™

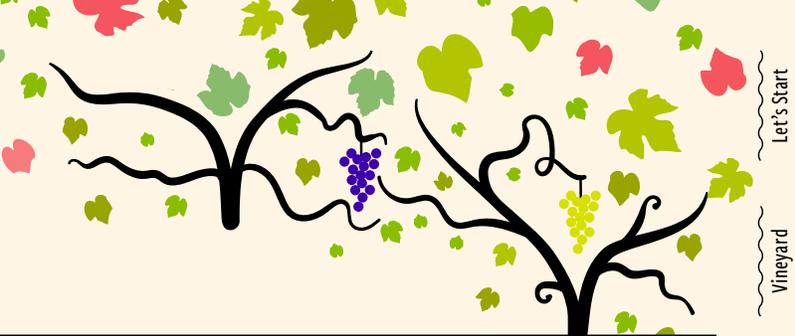
Stimulates fruity aroma compounds in red wines

STIMULA CABERNET™ is a yeast nutrient optimized to stimulate the yeast's production of fruity esters in red wines. When STIMULA CABERNET is added at 1/3 sugar depletion it triggers specific yeast metabolic pathways resulting in red and black fruit aromas. Wines made with STIMULA CABERNET are noted for their increased complexity and diminished vegetal/herbaceous notes. This 100% autolyzed yeast-based nutrient is rich in specific amino acids, small peptides, vitamins and minerals.

Find STIMULA CABERNET on page 47

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LALLEMAND

YEAST NUTRIENT

Stimula Syrah™

Stimulates floral and spicy aromas in red wines

STIMULA SYRAH™ optimizes the yeast's ability to reveal and enhance varietal compounds originating in certain red grapes maximizing fruity, floral and spicy aromas. Adding STIMULA SYRAH at the beginning of active fermentation stimulates yeast to liberate varietal thiols, terpenes and nor-isoprenoids. Due to its unique formulation, wines made using STIMULA SYRAH have less sulfur off-flavors like hydrogen sulfide.

Find STIMULA SYRAH on page 49



FINING AID

No[OX]

Animal-free, non-allergenic removal of oxidized characters in juice and wine

NO[OX] is an innovative, highly specialized chitosan*-bentonite fining aid. This animal-free, non-allergenic fining aid is superior to SO₂ and other casein alternatives at removing oxidized characteristics including color, aromas and flavors. Additionally, NO[OX] can remove herbaceous and bitter notes, increase freshness, resulting in significant quality improvements.

**At time of publication (April 2021) only chitosan products derived from Aspergillus niger may be used in wine to remove spoilage organisms (27 CFR § 24.250). Other uses and other sources of chitosan are not currently allowed. We are working to expand approval of Aspergillus niger-sourced chitosan for use in the applications described here. Check our website for updates.*

Find NO [OX] on page 99 and 100

LALLEMAND

INACTIVATED YEAST

GLUTASTAR™

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 54 and 55



FINING AID

Qi'UP XC

Animal-free, non-allergenic juice clarification fining aid

Qi'UP XC is used in juice for superior clarification. This innovative floccing agent is used during juice flotation and traditional cold settling and is an animal-free, non-allergenic alternative to gelatin. Qi'UP XC is a specialized preparation of chitosan* that has a high surface charge allowing it to bind to solid particles in juice resulting in excellent clarification.

**At time of publication (April 2021) only chitosan products derived from Aspergillus niger may be used in wine to remove spoilage organisms (27 CFR § 24.250). Other uses and other sources of chitosan are not currently allowed. We are working to expand approval of Aspergillus niger-sourced chitosan for use in the applications described here. Check our website for updates.*

Find Qi'UP XC on page 100

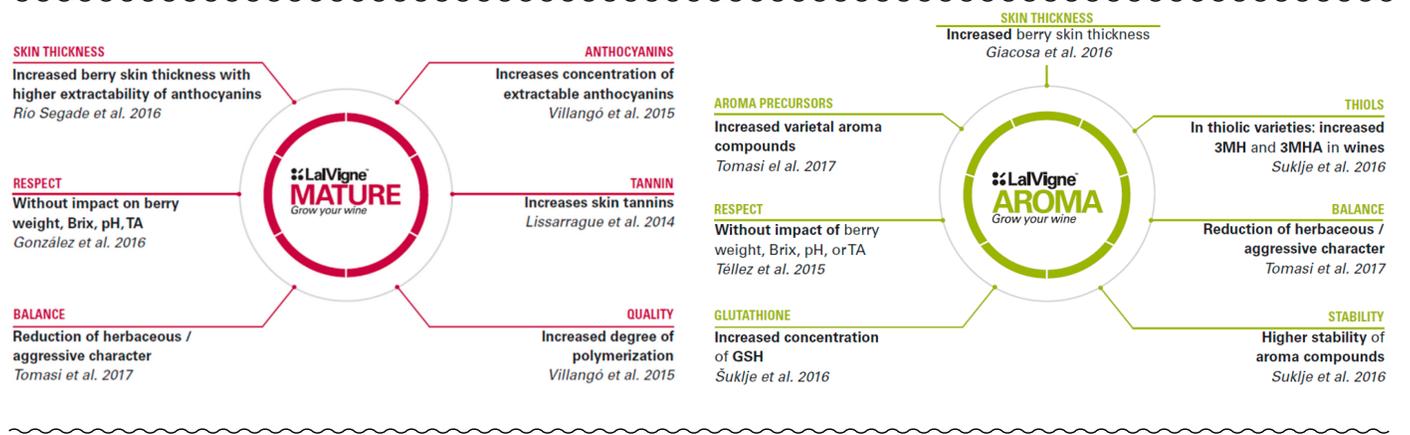
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VINEYARD PRODUCTS

Modern winegrowers face many challenges including increasing climatic uncertainty, demands from consumers looking for fewer chemical inputs in the vineyard, and high expectations of grape quality all while maintaining crop yields. Modern winegrowers need innovative vineyard strategies to meet current and future challenges.

Lallemand has developed several innovative products for use in the vineyard. Derived from inactivated yeast, the LALVIGNE® products 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.



SELECTING LALVIGNE FOR SUCCESS

Each vineyard will differ in its potential to provide quality grapes and yield depending on many factors. For optimum wine quality vineyard practices and products are tailored to the vineyard location, the stage of growth of the vines, the vintage conditions, and the grape variety.

VINEYARD LOCATION	VINE GROWTH PHASE	VINTAGE CONDITIONS	GRAPE VARIETY
Vineyard sites are all unique, with different soil types, climates, disease pressure, and surrounding flora and fauna. A challenge with cool sites is that aromas and flavors sometimes have not fully developed when weather finally forces the harvest. A challenge with hot sites is that Brix levels can be well ahead of phenolic ripeness, resulting in long hang times. Management practices are adapted to the challenges and potential of each unique vineyard location.	During the annual growth cycle, environmental stresses can influence shoot growth, yield, and fruit quality. Vineyard practices and product applications during the key growth stages can have a positive influence on the desired grape and wine quality outcomes.	A vintage is characterized by weather conditions, pre-dominately precipitation and temperature. Weather events such as Spring frost, rainfall, hail, and heat spikes can negatively impact vine growth, fruit set and ripening. Wine growers must constantly adapt new strategies to each season's conditions to produce the best wine grapes possible in the vintage.	Each grape variety has benefits and challenges. The goal is to bring out the positive phenolic and aromatic potential unique to each variety in the vineyard. Vineyard management practices and products are used to enhance the varietal characteristics of the grapes and resulting wines.

LALVIGNE® AROMA + LALVIGNE LA LaVigne Grow Your Wine

Yeast-based foliar spray for enhancing varietal expression

White grape varieties

#17501	3 kg LALVIGNE AROMA*	\$115.00
#17500	3 kg LALVIGNE LA**	\$115.00

LALVIGNE®AROMA can improve both grape and wine quality by increasing varietal compounds and improving mouthfeel in challenging conditions. LALVIGNE®AROMA increases the concentration of glutathione which helps protect aromatic compounds from degrading and makes them more stable for aging. In thiolic varieties, LALVIGNE®AROMA increases 3MH aromatic precursors which convert to 3MHA. This results in an increased concentration of thiol aromatic compounds and a reduction of negative green characteristics in varieties such as Sauvignon blanc. There is minimal impact on berry weight, Brix, pH or TA.

Recommended Dosage 1 treatment = 2 applications = \$94/acre	1 application =	2.7 lb/acre/1.2 kgs/acre
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LAVIGNE® MATURE + LALVIGNE LM LaVigne Grow Your Wine

Yeast-based foliar spray for phenolic maturity and uniform ripening

Red grape varieties

#17511	1 kg LALVIGNE MATURE*	\$115.00
#17510	1 kg LALVIGNE LM**	\$115.00

LALVIGNE®MATURE advances phenolic maturity and homogenizes the ripening process in challenging conditions. With the use of LALVIGNE®MATURE, there is an earlier and larger window of opportunity for harvesting due to advanced phenolics, tannin ripeness, and decreased harsh green notes. LALVIGNE®MATURE also increases skin thickness which allows for better extractability of anthocyanin as well as improved skin tannin texture and polymerization. There is minimal impact berry weight, Brix, pH or TA.

Recommended Dosage 1 treatment = 2 applications = \$94/acre	1 application =	0.9 lb/acre/405 g per acre
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How it works

Many physiological changes occur rapidly from lag phase to veraison. During this critical ripening period LALVIGNE® MATURE/LM and LALVIGNE® AROMA/LA are sprayed on the vines at 5% veraison and 10-12 days later. Key enzymes which control the levers and throttles of the aromatic precursor and phenolic pathways turn on, allowing a allowing increased and faster flow of these compounds into the berries.

Application timing for LALVIGNE® MATURE/LM and LALVIGNE® AROMA/LA

- 1. First Application:** 5%-50% veraison (5% is ideal). At this point, LALVIGNE® activates enzymes that regulate aromatic and phenolic precursor pathways. This increases the flow of aromatic and phenolic compounds into the berries while decreasing pyrazines.
- 2. Second Application:** 7-14 days following the first application (10-12 days is ideal). At this point, LALVIGNE® continues the flow of aromatic and phenolic compounds to the ripening berries.
- 3. Harvest on Your Schedule:** LALVIGNE® application results in an earlier and larger harvest window due to advances in aromatic and phenolic maturity. It has minimal impact on other maturity factors such as berry weight, Brix, pH, and total acidity.

**LALVIGNE® AROMA® and LALVIGNE® MATURE are registered in the following states:

AL, AK, AZ, CT, DE, FL, GA, HI, IL, IN, IA, KS, KY, LA, MD, MA, MI, MO, MT, NE, NV, NH, NJ, NY, NC, OR, RI, TN, UT, VT, VA, WA, WY

LALVIGNE® LA and LALVIGNE® LM are registered in the following states: CA, CO, ME, MN, MS, NM, OH, PA, SC, TX, WI

The following states have no registered use: ID, ND, OK, SD, WV

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YEAST

Since our founding in 1933 as the Berkeley Yeast Laboratory, yeast has been at the heart of our portfolio. Our first commercial yeasts 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 1974 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 Oenology 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, titratable acidity (TA), malic acid and potassium concentration for each lot is also helpful for your entire winemaking plan.

We suggest selecting yeast based first on its technical compatibility with grape and winery conditions and secondly on its sensory contribution and compatibility with the desired wine style. For assistance see yeast strain selection charts on pgs 12-17.

As a reminder:

FERMENTABLE SUGAR	YAN	TEMPERATURE	SENSORY IMPACT
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.	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.	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 good cap management is required to ensure homogeneous temperatures. When working with high sugar fermentations, lower temperatures are recommended.	Yeast contribute to wine aroma, flavor and mouthfeel. Some strains enhance varietal characters increasing fruity, tropical, spicy and floral notes. Other strains can produce esters increasing fruity and floral aromas. Certain strains produce polysaccharides and other compounds increasing mouthfeel. Lastly, some strains have a neutral sensory impact thereby preserving inherent grape qualities.

WHY SHOULD YOU ADD 25 g/hL* OF YEAST?

Lower potential for osmotic shock	Shorter lag phase	Fast onset of fermentation	Shorter fermentation length	Lower final VA	Lower final residual sugar	Healthier cell population
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* If sugar is greater than 25°Brix you should increase your inoculation rate to at least 30g/hL (2.5 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 traits 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 breed 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 traits. 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 Oenology 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 the 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 fermentation outcome and wine quality?

In the early 2000s, Lallemand Oenology began developing a new yeast preparation technique. The Yeast Security and Sensory Optimization process (YSEO) optimizes 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 was fermented with yeast produced with the YSEO process and the other with the

traditional yeast production process. Other trials have shown that the YSEO process can enhance strain performance in other ways including reduced lag phase, faster fermentation times, decreased H₂S production, better adaption to stressful conditions and reduced malolactic fermentation antagonism. YSEO makes a good yeast even better.

YSEO IS A UNIQUE AND INNOVATIVE PRODUCTION 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
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Production of Volatile Acidity in Yeast Produced with and without the YSEO Process

	Yeast without YSEO (g/L acetic acid)	Yeast with YSEO (g/L acetic acid)
Italy (Montepulciano)	0.29	0.18
INRA (Sauvignon)	0.51	0.42
INRA (Sauvignon)	0.31	0.13
WSU (Riesling)	0.44	0.31
WSU (Syrah)	0.23	0.21
WSU (Cabernet Sauvignon)	0.58	0.38

Adapted from the article, *Evaluation of the YSEO Process to Prepare Dried Winemaking Yeast* by Sibylle Krieger¹, Anne Ortiz-Julien¹, Françoise Raginel¹, Ann Dumont¹, Forbes Wardrop¹, Charles G. Edwards²

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² Department of Food Science and Human Nutrition, Washington State University, Pullman, WA, U.S.A.



YEAST STRAINS FOR WHITE & ROSÉ WINE

Yeast Strain Type	43/43 RESTART	58W3	71B	ALCHEMY I	ALCHEMY II	ASSMANSHAUSEN (AMH)	BA11	BM 4X4	BRG	CEG (EPERNAY II)	CROSS EVOLUTION	CVW5	CY3079	DV10	EC1118	ELIXIR	EXOTICS MOSAIC	EXOTICS NOVELLO	FERMIVIN CHAMPION	FERMIVIN SM102	ICV D21	
Recommended																						
Mouthfeel																						
Enhanced Varietal Character																						
Esters																						
Moderate																						
Neutral																						
Sensitive																						
Average																						
Page#	18	18	18	19	19	20	20	21	21	21	22	23	23	23	23	24	24	24	25	25	25	
<i>S. cerevisiae cerevisiae</i>		○	○				○		○	○			○								○	○
<i>S. cerevisiae bayanus</i>	○											○		○	○				○			
Yeast hybrid/other						○					○					○	○	○				
Yeast blend				○	○			○														
Alcohol Tolerance ¹	17%	14%	14%	15.5%	15.5%	15%	16%	16%	15%	13.5%	15%	15%	15%	17%	18%	15%	15.5%	15.5%	18%	12%	16%	
YAN Requirements ²	Low	Med	Low	Med	Med	Med	High	High	High	Med	Low	Low	High	Low	Low	Med	Med	Med	Med	MED	Med	
Temp. Range (°F) ³	55-95	54-77	59-85	56-61	56-61	68-86	59-77	64-82	64-88	59-77	58-68	57-82	59-77	50-95	50-86	57-77	64-83	62-82	59-86	61-72	61-86	
Fermentation Speed	Fast	Mod	Mod	Fast	Fast	Slow	Mod	Mod	Fast	Slow	Mod	Fast	Mod	Fast	Fast	Slow	Mod	Mod	Mod	SLOW	Mod	
Competitive Factor	Yes	Ntrl	Snstv	Yes	Yes	Snstv	Snstv	Yes	Ntrl	Snstv	Yes	Yes	Snstv	Yes	Yes	Snstv	Yes	Yes	Ntrl	Yes	Yes	
MLF Compatibility	Very Good	Very Good	Very Good	Good	Good	Very Good	Good	Below Avg	Avg	Not Known	Good	Very Good	Good	Good	Avg*	Avg	Very Good	Good	Good	Avg	Good	
Sensory Effect	Ntrl	Evc, E, M	E	Evc, E	Evc	Evc	E, M	Evc, M	Evc, M	E	Evc, M	E	Evc, M	Ntrl	Ntrl	Evc, E	Evc, M	Evc, M, E	Ntrl	E	Evc, M	
Fruity (Esters)		▲	▲			▲	▲			▲		▲	▲			▲	▲	▲		▲	▲	
Green (Thiols)					▲																	
Tropical (Thiols)				▲	▲		▲				▲					▲	▲	▲				
Citrus (Esters And Thiols)				▲	▲											▲		▲				
Floral		▲					▲				▲		▲			▲		▲		▲		
Nutty													▲									
Mineral/Freshness									▲					▲							▲	
Spicy		▲				▲	▲															
Mouthfeel		▲					▲	▲	▲		▲		▲				▲				▲	
Aromatic Whites		▲	▲	▲	▲	▲	▲				▲	▲				▲	▲	▲			▲	
Chardonnay				▲			▲	▲			▲	▲	▲	▲				▲			▲	
Sauvignon blanc				▲	▲						▲			▲		▲		▲		▲		
Rhone Style Whites		▲		▲			▲				▲		▲	▲		▲	▲				▲	
Rosé			▲							▲		▲				▲	▲				▲	
Suitable For Barrel Fermentation								▲					▲								▲	
No-Low H ₂ S, SO ₂ Production Strains																						
Suitable For Restarting A Stuck Fermentation	▲																		▲			

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

2. YAN requirements refer to how much nitrogen one strain requires relative to the other strains on this chart. See article on pg 45.

* Compatible under normal conditions, below average if high SO₂ used at crush.

YEAST STRAINS FOR WHITE & ROSÉ WINE

Yeast Strain Type	ICV D47	ICV D254	ICV GRE	ICV OKAY	ICV OPALE 2.0	ICV SUNROSE	IOC BE FRUITS	IOC BE THIOLS	K1 (V1116)	M83	MSB	NT 116	QA23	R2	RHÔNE 4600	RHST	SAUVY	SENSY	VIN 13	VIN 2000	W15
Page#	26	26	26	27	27	27	27	28	28	28	29	29	30	30	31	31	32	32	33	33	34
<i>S. cerevisiae cerevisiae</i>	○	○	○			○			○	○					○	○	○				○
<i>S. cerevisiae bayanus</i>											○		○	○							
Yeast hybrid/other				○	○		○	○				○						○	○	○	
Yeast blend																					
Alcohol Tolerance ¹	15%	16%	15%	16%	14%	16%	14%	15%	18%	15%	14.5%	16%	16%	16%	15%	15%	14%	15%	17%	15.5%	16%
YAN Requirements ²	Low	Med	Med	Low	Low	Med	Low	Med	Med	Med	Med	Med	Low	High	Low	Med	Med	Low	Low	Low	High
Temp. Range (°F) ³	60-82	54-82	59-82	54-86	59-86	57-68	54-75	59-77	50-95	63-82	57-68	54-61	59-90	50-86	56-72	50-86	57-68	54-64	54-61	55-61	50-81
Fermentation Speed	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Fast	Fast	Mod	Mod	Fast	Fast	Mod	Mod	Mod	Mod	Mod	Fast	Mod	Mod
Competitive Factor	Yes	Ntrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ntrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MLF Compatibility	Very Good	Very Good	Very Good	Very Good	Good	Good	Good	Good	Poor	Avg	Not Known	Good	Very Good	Good	Very Good	Good	Not Known	Very Good	Good	Good	Very Good
Sensory Effect	Evc, M	Evc, M	Evc, M	E	Evc, E	E	E	Evc	E	Evc, M	Evc, M	Evc, E	Evc	Evc	E	Evc, M	Evc	Evc, M	Evc, E	Evc, E	Evc, M
Fruity (Esters)	▲		▲	▲	▲	▲	▲		▲	▲	▲	▲	▲	▲	▲			▲	▲		▲
Green (Thiols)																	▲				
Tropical (Thiols)								▲			▲	▲	▲		▲					▲	▲
Citrus (Esters And Thiols)	▲				▲			▲			▲	▲	▲			▲				▲	▲
Floral	▲								▲				▲	▲		▲				▲	
Nutty		▲																			
Mineral/Freshness																					
Spicy													▲								
Mouthfeel	▲	▲	▲		▲					▲	▲					▲		▲			▲
Aromatic Whites	▲			▲	▲		▲					▲	▲	▲		▲		▲	▲		▲
Chardonnay	▲	▲			▲								▲					▲			▲
Sauvignon blanc					▲			▲			▲		▲	▲		▲	▲			▲	
Rhone Style Whites	▲	▲	▲	▲	▲										▲	▲					
Rosé	▲		▲		▲	▲	▲	▲		▲					▲				▲		▲
Suitable For Barrel Fermentation	▲	▲																			▲
No-Low H ₂ S, SO ₂ Production Strains				▲	▲		▲	▲										▲			
Suitable For Restarting A Stuck Fermentation																					

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.

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.

Red Wine Yeast Strains continue on next page →

YEAST STRAINS FOR RED WINE

○ Yeast Strain Type
 ● Recommended
 M Mouthfeel
 Evc Enhanced Varietal Character
 E Esters
 Mod Moderate
 Ntrl Neutral
 Snstv Sensitive
 Avg Average

	43	43 RESTART	71B	3001	ALCHEMY III	ALCHEMY IV	ASSMANSHAUSEN (AMH)	BDX	BM 4X4	BRG	BR197	CLOS	CSM	CVRP	EXOTICS MOSAIC	EXOTICS NOVELLO	FERMIVIN CHAMPION	FERMIVIN MT48
Page#	18	18	18	19	19	20	20	20	21	21	21	22	22	22	24	24	25	25
<i>S. cerevisiae cerevisiae</i>			○	○				○		○	○	○	○	○				○
<i>S. cerevisiae bayanus</i>	○	○															○	
Yeast hybrid/other							○								○	○		
Yeast blend					○	○			○									
Alcohol Tolerance ¹	17%	17%	14%	15%	15.5%	15.5%	15%	16%	16%	15%	16%	17%	14%	16%	15.5%	15.5%	18%	15%
YAN Requirements ²	Low	Low	Low	Med	Med	Med	Med	Med	High	High	Med	Med	Med	Med	Med	Med	Med	Low
Temp. Range (°F) ³	55-95	55-95	59-85	54-90	61-82	61-82	68-86	64-86	64-82	64-88	62-85	57-90	59-90	64-86	64-83	62-82	59-86	68-86
Fermentation Speed	Fast	Fast	Mod	Mod	Fast	Fast	Slow	Mod	Mod	Fast	Mod	Fast	Mod	Mod	Mod	Mod	Mod	Mod
Competitive Factor	Yes	Yes	Snstv	Yes	Yes	Yes	Snstv	Snstv	Yes	Ntrl	Yes	Yes	Yes	Yes	Yes	Yes	Ntrl	Ntrl
MLF Compatibility	Very Good	Very Good	Very Good	Very Good	Good	Good	Very Good	Avg	Below Avg	Avg	Avg	Very Good	Good	Very Good	Very Good	Good	Good	Very Good
Sensory Effect	NTRL	NTRL	E	Evc	Evc	E, M	Evc	Evc, M	Evc, M	Evc, M	Evc	Evc, M	Evc	Evc, M	Evc, M	Evc, M, E	NTRL	Evc, M
Cocoa/Caramel															●			
Floral					●				●						●			●
Freshness										●								
Fruit-Black												●	●	●		●		●
Fruit-Red	●		●	●	●	●	●		●		●	●	●	●	●	●		●
Fruit-Jammy								●	●		●	●		●				
Savory				●			●		●									
Spicy							●	●	●	●			●			●		●
Mouthfeel Impact (Roundness And/Or Structured)				●		●		●	●	●		●		●	●	●		●
Minimizes Herbaceousness					●	●		●					●	●		●		
No-Low H ₂ S, SO ₂ Production Strains																		
Cabernet Sauvignon					●			●	●			●	●	●				
Merlot								●										
Pinot noir			●	●		●	●			●	●							
Light-Bodied Reds			●	●		●	●			●	●		●		●			●
Medium-Bodied Reds					●	●	●	●	●		●		●			●		●
Full-Bodied Reds	●				●			●	●			●		●				
Suitable For Restarting A Stuck Fermentation		●															●	

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

2. YAN requirements refer to how much nitrogen one strain requires relative to the other strains on this chart. See article on pg 45.

YEAST STRAINS FOR RED WINE

○ Yeast Strain Type Recommended
 M Mouthfeel
 Evc Enhanced Varietal Character
 E Esters
 Mod Moderate
 Ntrl Neutral
 Snstv Sensitive
 Avg Average

	ICV D21	ICV D80	ICV D254	ICV GRE	ICV OKAY	IONYS _{Wf}	MT	NT 116	NT 202	PERSY	RC212	RHÔNE 2226	RP15	SYRAH	T73	TANGO MALBEC	VRB	W15
Page#	25	26	26	26	27	28	29	29	29	30	30	31	31	32	33	33	34	34
<i>S. cerevisiae cerevisiae</i>	○	○	○	○		○	○				○	○	○	○		○	○	○
<i>S. cerevisiae bayanus</i>															○			
Yeast hybrid/other					○			○	○	○								
Yeast blend																		
Alcohol Tolerance ¹	16%	16%	16%	15%	16%	16%	15%	16%	16%	16%	16%	18%	17%	16%	16%	15.5%	17%	16%
YAN Requirements ²	Med	High	Med	Med	Low	Very High	Med	Med	Med	Low	Med	High	Med	Med	Low	Med	Med	High
Temp. Range (°F) ³	61-86	59-82	54-82	59-82	54-86	77-82	59-90	76-83	60-82	59-82	60-86	59-82	68-86	59-90	65-90	59-82	59-82	50-81
Fermentation Speed	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Fast	Fast	Mod	Mod	Fast	Mod	Mod	Mod	Mod	Mod	Mod
Competitive Factor	Yes	Yes	Ntrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ntrl	Yes	Yes	Yes	Yes	Ntrl	Ntrl	Yes
MLF Compatibility	Good	Good	Very Good	Very Good	Very Good	Good	Avg	Good	Very Good	Very Good	Good	Below Avg	Good	Avg	Below Avg	Good	Very Good	Very Good
Sensory Effect	Evc, M	Evc, M	Evc, M	Evc, M	E	M	Evc, M	Evc, M	Evc, E	Evc, M	Evc	Evc, M	Evc	Evc	E, M	Evc	Evc, M	Evc, M
Cocoa/Caramel							▲											
Floral	▲			▲			▲							▲		▲		
Freshness	▲			▲		▲				▲			▲		▲			
Fruit-Black			▲					▲	▲	▲		▲			▲	▲		
Fruit-Red				▲	▲		▲	▲	▲	▲	▲		▲	▲	▲	▲	▲	▲
Fruit-Jammy	▲	▲	▲									▲	▲				▲	
Savory									▲					▲				
Spicy		▲	▲				▲			▲	▲	▲		▲		▲		
Mouthfeel Impact (Roundness And/Or Structured)	▲	▲	▲	▲		▲	▲	▲		▲		▲			▲		▲	▲
Minimizes Herbaceousness			▲	▲														
No-Low H ₂ S, SO ₂ Production Strains					▲					▲								
Cabernet Sauvignon	▲	▲	▲			▲			▲				▲					
Merlot							▲			▲					▲	▲		
Pinot noir											▲							▲
Light-Bodied Reds				▲						▲	▲							▲
Medium-Bodied Reds	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Full-Bodied Reds	▲	▲	▲		▲	▲	▲	▲	▲	▲		▲	▲	▲	▲		▲	
Suitable For Restarting A Stuck Fermentation																		

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.

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

	58W3	71B	ALCHEMY I	CROSS EVOLUTION	CVW5	CY3079	ELIXIR	EXOTICS MOSAIC	FERMIVIN SM102	ICV D47	ICV OPALE 2.0	IOC BE FRUITS	IOC BE THIOLS	NT116	QA23	SAUVY	VIN13	VIN2000
Page#	18	18	19	22	23	23	24	24	25	26	27	27	28	29	30	32	33	33
Alcohol Tolerance ¹	14%	14%	15.5%	15%	15%	15%	15%	15.5%	12%	15%	14%	14%	15%	16%	16%	14%	17%	15.5%
YAN Requirements ²	Med	Low	Med	Low	Low	High	Med	Med	Med	Low	Low	Low	Med	Med	Low	Med	Low	Low
Temp. Range (°F) ³	54-77	59-85	56-61	58-68	57-82	59-77	57-77	64-83	61-72	60-82	59-86	54-75	59-77	54-61	59-90	57-68	54-61	55-61
Fermentation Speed	Mod	Mod	Fast	Mod	Fast	Mod	Slow	Mod	Slow	Mod	Mod	Mod	Fast	Fast	Fast	Mod	Fast	Mod
Competitive Factor	Ntrl	Snstv	Yes	Yes	Yes	Snstv	Snstv	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MLF Compatibility	Avg	Very Good	Good	Good	Very Good	Good	Avg	Very Good	Avg	Very Good	Good	Good	Good	Good	Very Good	Not Known	Good	Good
Reduces Malic Acid Content		♣						♣										
Sensory Effect	EvC, E, M	E	EvC, E	EvC, M	E	EvC, M	EvC, E	EvC, M	E	EvC, M	EvC, E	E	EvC	EvC, E	EvC	EvC	EvC, E	EvC, E
Fruity (Esters)	♣	♣			♣	♣	♣	♣		♣	♣	♣		♣	♣		♣	
Tropical (Thiols)			♣	♣			♣	♣					♣	♣	♣		♣	♣
Citrus (Esters And Thiols)			♣				♣			♣	♣		♣	♣	♣		♣	♣
Floral	♣			♣		♣	♣		♣	♣					♣		♣	
Spicy	♣														♣			
Mouthfeel	♣			♣		♣		♣		♣	♣							
Aromella	♣		♣				♣		♣	♣			♣		♣		♣	
Blanc Du Bois			♣		♣		♣					♣	♣		♣	♣	♣	♣
Brianna	♣	♣			♣		♣				♣	♣		♣				♣
Cayuga White		♣		♣	♣		♣		♣	♣	♣	♣		♣	♣		♣	♣
Chardonnell			♣	♣	♣	♣				♣	♣				♣		♣	♣
Edelweiss	♣	♣			♣		♣		♣		♣	♣		♣				♣
Frontenac blanc		♣	♣		♣		♣				♣		♣		♣	♣	♣	♣
Frontenac gris		♣		♣	♣		♣	♣	♣	♣	♣	♣			♣	♣		
Itasca	♣	♣			♣							♣			♣		♣	♣
La Crescent	♣	♣	♣				♣	♣			♣		♣		♣	♣	♣	
Muscadine					♣										♣		♣	
Rosé		♣		♣					♣		♣	♣	♣					
Seyval blanc			♣				♣	♣							♣	♣		♣
Traminette	♣		♣				♣				♣		♣		♣	♣		♣
Vidal blanc			♣		♣		♣				♣							♣
Vignoles	♣	♣	♣	♣	♣		♣		♣		♣		♣	♣	♣		♣	

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

2. YAN requirements refer to how much nitrogen one strain requires relative to the other strains on this chart. See article on pg 45.

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 *Vitis rotundifolia* (Muscadine) and *V. 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 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

YEAST STRAINS FOR AMERICAN & HYBRID RED CULTIVARS

	71B	3001	ALCHEMY III	ALCHEMY IV	BM 4X4	CLOS	CSM	CVRP	EXOTICS MOSAIC	ICV D254	ICV GRE	NT 202	PERSY	RC212	SYRAH	T73	VRB	WT5
Page#	18	19	19	20	21	22	22	22	24	26	26	29	30	30	32	33	34	34
Alcohol Tolerance ¹	14%	15%	15.5%	15.5%	16%	17%	14%	16%	15.5%	16%	15%	16%	16%	16%	16%	16%	17%	16%
YAN Requirements ²	Med	Low	Med	Med	High	Med	Med	Med	Med	Med	Med	Med	Low	Med	Med	Low	Med	High
Temp. Range (°F) ³	59-85	54-90	61-82	61-82	64-82	57-90	59-90	64-86	64-83	54-82	59-82	60-82	60-86	60-86	59-90	65-90	59-82	50-81
Fermentation Speed	Mod	Mod	Fast	Fast	Mod	Fast	Mod	Mod	Mod	Mod	Mod	Fast	Mod	Mod	Mod	Mod	Mod	Mod
Competitive Factor	Yes	Snstv	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ntrl	Yes	Yes	Yes	Ntrl	Yes	Yes	Ntrl	Yes
MLF Compatibility	Very Good	Very Good	Good	Good	Below Avg	Very Good	Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Good	Avg	Below Avg	Very Good	Very Good
Sensory Effect	E	Evc	Evc	E, M	Evc, M	Evc, M	Evc	Evc, M	Evc, M	Evc, M	Evc, M	Evc, E	Evc, M	Evc	Evc	E, M	Evc, M	Evc, M
Fruit-Black						♦	♦	♦		♦		♦	♦			♦		
Fruit-Red	♦	♦	♦	♦	♦	♦	♦	♦	♦		♦	♦	♦	♦	♦	♦	♦	♦
Spicy					♦		♦			♦			♦	♦	♦			
Mouthfeel Impact (Roundness And/Or Structured)		♦		♦	♦	♦		♦	♦	♦	♦		♦			♦	♦	♦
Minimizes Herbaceousness				♦	♦		♦			♦	♦							
Reduces Malic Acid Content	♦																♦	
Baco noir	♦	♦		♦					♦			♦	♦	♦				
Black Spanish				♦	♦	♦	♦	♦			♦		♦			♦		
Chambourcin	♦	♦		♦	♦		♦	♦		♦		♦	♦	♦			♦	♦
Concord	♦			♦								♦						
Crimson Pearl			♦	♦			♦		♦	♦		♦	♦	♦		♦		
Frontenac	♦	♦		♦	♦		♦		♦			♦	♦	♦				
Maréchal Foch		♦		♦					♦		♦	♦	♦	♦				
Marquette	♦	♦		♦	♦	♦	♦		♦	♦		♦	♦	♦		♦		♦
Noiret			♦	♦		♦	♦	♦	♦		♦	♦	♦		♦		♦	♦
Norton		♦	♦	♦		♦	♦	♦	♦	♦		♦	♦				♦	
Petite Pearl	♦		♦	♦		♦				♦		♦	♦	♦			♦	
St. Croix				♦		♦	♦			♦	♦	♦	♦					
Verona	♦	♦	♦	♦						♦		♦	♦					

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.

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.

HYBRID AND NON-VINIFERA WINES (CONTINUED)

flavorless thiol precursors into aromatic elements or produce enzymes that cleave glycosidic bonds and release aromatic terpenes 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.

YEAST STRAIN DESCRIPTIONS

43

Fructophilic yeast for high sugar fermentations

Zinfandel, Sangiovese, Syrah, Late Harvest

UVAFERM 43™ is a *Saccharomyces cerevisiae bayanus* strain that gives high-quality sensory results in high Brix red fermentations and helps maintain color, red fruit, and cherry characteristics.

#15134	500 g	\$46.40
#15140	10 kg	\$564.20

Isolated by Lallemend Oenology in collaboration with the research center of Inter-Rhône in France.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 55-95°F	Sensory: NEUTRAL
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43 RESTART

Preacclimated fructophilic yeast for restarting stuck fermentations

Restart Stuck Fermentations, Late Harvest

UVAFERM 43 RESTART™ is a preacclimated yeast adapted to quickly restart a stuck fermentation. This yeast is the result of an innovative process developed by Lallemend Oenology using UVAFERM 43™, a strain isolated by Lallemend Oenology in collaboration with Inter-Rhône in France.

43 RESTART's resistance to stressful conditions of stuck fermentations has been naturally enhanced. Acclimation includes addition of micronutrients, sterols, and polyunsaturated fatty

#15223	500 g	\$55.50
#15240	10 kg	\$677.10

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 very malolactic bacteria compatible.

For best results use the 43 RESTART protocol for stuck wines. See pg 41 for protocol which includes RESKUE™ and FERMAID O™ and best practices.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 55-95°F	Sensory: NEUTRAL
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58W3

Spicy and fruity aromatic white wines

Pinot gris, Gewürztraminer, Riesling, Viognier, Rhône Whites, Aromatic Whites

VITILEVURE 58W3™ contributes an overall well-balanced mouthfeel with spicy, floral and fruity aromas.

Allows for the release of bound terpenes in aromatic varieties due to the strain's beta-glucosidase activity. This enhances classic varietal characters.

#15630	500 g	\$49.40
#15631	10 kg	\$596.50

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.

Alcohol Tolerance: 14%	Nitrogen Needs: MEDIUM	Temp. Range: 54-77°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS, MOUTHFEEL
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71B

Softens high malic acid grapes

Pinot gris, Riesling, Grenache, Rosé, Fruit Forward Reds

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

Softens high acid musts by partially metabolizing malic acid.

#15059	500 g	\$32.30
#15078	10 kg	\$418.20

Sensitive to competitive factors and may have difficulty competing with wild microflora. Careful rehydration with GO-FERM PROTECT 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.

Alcohol Tolerance: 14%	Nitrogen Needs: LOW	Temp. Range: 59-85°F	Sensory: ESTERS
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3001

Enhanced varietal expression in Pinot noir

Pinot noir

VITILEVURE 3001™ enhances the varietal characteristics, intensity and balance of Pinot noir.

Wines made with 3001 are noted for their fruit and varietal characteristics that are complex and elegant with good aging potential.

This strain was isolated, studied and selected from the prestigious Côte de Nuits terroir in Burgundy and is particularly suitable for inoculation into musts that have undergone pre-fermentation cold maceration (cold soak).

3001 is tolerant to standard cold soak SO₂ additions and can withstand lower inoculation temperatures.

#15682 | 500 g | \$49.40

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 54-90°F	Sensory: ENHANCE VARIETAL CHARACTERISTICS (EVC)
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ALCHEMY I

Blend of yeast strains for fruity and floral esters

Sauvignon blanc, Chardonnay, Chenin blanc, Riesling, Pinot gris, Rhône Whites, Aromatic Whites

ALCHEMY I produces fruity and floral esters and reveals volatile thiols (boxwood, passion fruit, guava and grapefruit aromas).

ALCHEMY I is both a strong aroma producer and a fast fermenter with low foam production.

Temperature control is advised, and barrel fermentations should be avoided.

ALCHEMY I is a specific blend of *S. cerevisiae* wine yeast strains developed in collaboration with the Australian Wine Research Institute (AWRI) in South Australia.

15174 | 1 kg | \$105.80

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 56-61°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS
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ALCHEMY II

Blend of yeast strains for expressing volatile thiols

Albariño, Sauvignon blanc, Chenin blanc, Rhône Whites

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).

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

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

15177 | 1 kg | \$105.80

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 56-61°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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ALCHEMY III

Blend of yeast strains for complex structured reds

Cabernet Sauvignon, Malbec, Zinfandel, Tempranillo, Grenache, Petit Verdot, Structured Reds

ALCHEMY III is a very high producer of 2-phenylethanol (rose), 2-phenylethyl acetate (floral and fruity), β-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, produces minimal SO₂ and high levels of glycerol (8-11 g/L).

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

#15230 | 1 kg | \$105.80

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 61-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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ALCHEMY IV

Blend of yeast strains for intensely fruity reds

Pinot noir, Syrah, Cabernet Franc, Sangiovese, Fruit Forward Reds

ALCHEMY IV was formulated for the production of intense red fruit characters such as cherry, red currant, raspberry and pomegranate. The high production of ethyl esters, especially ethyl hexanoate (fruity) contributes to the longevity of the fruit aromas.

ALCHEMY IV can diminish herbaceous, vegetal, and unripe flavors and elevate terpenes while producing smooth, easy-

#15231	1 kg	\$105.80
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drinking, round wines with heightened aroma intensity.

ALCHEMY IV is a strong fermenter, produces minimal SO₂, and high levels of glycerol (8–11 g/L).

ALCHEMY IV is a specific blend of *Saccharomyces cerevisiae* wine yeast strains developed in collaboration with the AWRI in South Australia.

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 61–82°F	Sensory: ESTERS, MOUTHFEEL
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ASSMANSHAUSEN (AMH)

Allows for the expression of indigenous microflora

Pinot noir, Zinfandel, Riesling, Petite Sirah, Gewürztraminer

ENOFERM AMH™ is a color friendly strain that enhances spicy (clove, nutmeg) and fruit flavors and aromas while adding overall complexity.

This strain has a long lag phase with a slow to medium fermentation rate. A well-managed nutrient program during rehydration and fermentation is essential.

#15632	500 g	\$49.40
#15633	10 kg	\$596.50

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 kudriavzevii* strain originating from the Geisenheim Research Institute in Germany.

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 68–86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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BA11

Strong fermenter for white wine mouthfeel

Riesling, Viognier, Pinot blanc, Gewürztraminer, Rosé, Muscat, Rhône Whites, Aromatic Whites

LALVIN BA11™ promotes clean aromatic characteristics with subtle notes of spice, orange blossom, pineapple and apricot.

Lees stirring releases polysaccharides for a full mouthfeel.

#15117	500 g	\$46.40
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This *S. cerevisiae cerevisiae* strain was selected in 1997 near the Estação Vitivinícola de Barraida in Portugal and is suitable for grapes from cool regions as well as relatively neutral varieties.

Alcohol Tolerance: 16%	Nitrogen Needs: HIGH	Temp. Range: 59–77°F	Sensory: ESTERS, MOUTHFEEL
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BDX

Steady fermenter for Bordeaux varieties

Merlot, Cabernet Sauvignon, Zinfandel, Petit Verdot, Structured Reds

UVAFERM BDX™ is a reliable fermenter that enhances varietal characteristics in Bordeaux varieties, emphasizing spicy and jammy notes.

Wines have good phenolic structure with increased mouthfeel

#15634	500 g	\$49.40
#15635	10 kg	\$596.50

and color.

BDX is a reliable fermenter that does not generate a lot of heat. Selected from the Institut Pasteur strain collection in Paris, France.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 64–86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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BM 4X4

Aromatic complexity and mouthfeel in reds and whites

Sangiovese, Cabernet Sauvignon, Grenache, Zinfandel, Chardonnay, Italian Reds

Wines made using LALVIN BM 4X4™ have sensory descriptors which include jam, floral and cherry liqueurs, sweet spice, lico-rice, cedar and earthy.

Produces high levels of polyphenol-reactive polysaccharides, resulting in red wines with increased mouthfeel and improved color stability.

In white wines, BM 4X4 produces high levels of esters and poly-

#15176	500 g	\$55.50
#15200	10 kg	\$660.00

saccharides resulting in fruity aromas and round mouthfeel.

Lalvin BM 4X4™ is a blend of Lalvin BM45™ (see scottlab.com for more information) and another yeast known for fermentation reliability. The BM 4X4 blend was formulated to provide the aromatic complexity of BM45 while providing greater reliability under difficult fermentation conditions.

Below average malolactic fermentation compatibility.

Alcohol Tolerance: 16%	Nitrogen Needs: HIGH	Temp. Range: 64–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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BRG

Classic strain for Burgundy varieties

Chardonnay, Pinot noir

LEVULINE BRG™ is the reference strain for Burgundian winemakers.

Increases minerality in whites such as Chardonnay and spice characters in reds like Pinot noir.

BRG is a fast fermenter. Produces significant amounts of poly-

#15669	500 g	\$46.40
#15670	10 kg	\$492.70

saccharides 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.

Alcohol Tolerance: 15%	Nitrogen Needs: HIGH	Temp. Range: 64–88°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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BRL97

Enhanced color stability and structure in color sensitive varieties

Pinot noir, Zinfandel, Barbera, Merlot, Malbec, Petit Verdot

LALVIN BRL97™ respects varietal characteristics and helps retain color in grapes sensitive to color loss.

Fast starter and a moderate speed fermenter. Demonstrates good malolactic fermentation compatibility and high alcohol tolerance.

#15102	500 g	\$46.40
#15205	10 kg	\$564.20

This strain was isolated at the University of Torino in Italy from a Nebbiolo fermentation.

To enhance complexity, BRL97 fermented wine may be blended with wines fermented with LALVIN RC212™ or W15™.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 62–85°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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CEG (EPERNAY II)

Sweet and semi-sweet wine production

White, Rosé

UVAFERM® CEG often slows or stops under stressed conditions making it ideal for semi-dry white or rosé wine production.

Under normal fermentation conditions CEG is noted for its

#15081	500 g	\$25.20
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ability to deliver slow, steady and clean fermentations.

Isolated by the Geisenheim Research Institute in Germany.

Alcohol Tolerance: 13.5%	Nitrogen Needs: MEDIUM	Temp. Range: 59–77°F	Sensory: ESTERS
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CLOS

Aromatic complexity and mouthfeel in big reds

Syrah, Grenache, Tempranillo, Zinfandel, Petite Sirah, Barbera, Petit Verdot, Structured Reds, Malbec

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.

Alcohol Tolerance: 17%	Nitrogen Needs: MEDIUM	Temp. Range: 57-90°	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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#15201	500 g	\$46.40
#15204	10 kg	\$564.20

This strain was isolated by the University of Rovira i Virgili in Spain from the Priorat region.

CROSS EVOLUTION

Natural yeast hybrid to enhance aromatics and mouthfeel

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

CROSS EVOLUTION™ increases fresh fruit and floral aromas in white and rosé wines.

This strain complements increased mouthfeel resulting in aromatic wines that are well-balanced.

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 58-68°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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#15640	500 g	\$49.40
#15641	10 kg	\$596.50

CROSS EVOLUTION is a strong fermenter and ideal for aromatic white and rosé wines that have a high alcohol potential.

This hybrid yeast is from a unique breeding program at the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa.

CSM

Minimizes herbaceous characters in under-ripe fruit

Cabernet Sauvignon, Cabernet Franc, Merlot, Petit Verdot

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.

Alcohol Tolerance: 14%	Nitrogen Needs: MEDIUM	Temp. Range: 59-90°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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#15638	500 g	\$49.40
#15639	10 kg	\$596.50

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).

CVRP

Rich, round reds

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

CVRP™ is ideal for full-bodied reds where varietal definition, smooth mouthfeel and sweet tannin expression is desired.

This yeast overproduces polysaccharides resulting in round, full wines with decreased astringency and bitterness, stable color and complex, ripe fruit flavors.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 64-90°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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#15207	500 g	\$46.40
#15208	10 kg	\$564.20

CVRP has a moderate and steady fermentation rate, good malolactic compatibility and is one of the highest polysaccharide producing strains within the Lallemand Oenologies yeast portfolio.

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CVW5

Production of stable esters in whites

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

CVW5™ is a high producer of fruity aromas (esters) and low producer of volatile acidity and SO₂.

CVW5 has the lowest nitrogen demand of the Lallemmand Oenology yeast strains. Strong fermenter even under difficult conditions, including low turbidity.

#15237	500g	\$46.40
#15210	10 kg	\$564.20

This *S. cerevisiae bayanus* strain was selected from the Lallemmand Oenology yeast strain collection and is a daughter strain of LALVIN EC1118™ (see pg 23)

Storage: 4-11°C (39-52°F)

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 57-82°F	Sensory: ESTERS
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CY3079 (BOURGOBLANC)

Classic strain for barrel-fermented whites

Chardonnay, Pinot blanc

LALVIN CY3079 (Bourgoblanc)™ enhances aromas of fresh butter, almond, honey, flowers and pineapple.

Highly recommended for barrel-fermented and *sur lie* aged Chardonnay.

Autolyzes quickly at the end of fermentation resulting in round wines.

#15061	500 g	\$46.40
#15082	10 kg	\$564.20

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 Burgundys by the Bureau Interprofessionnel des Vins de Bourgogne (BIVB) in France.

Alcohol Tolerance: 15%	Nitrogen Needs: HIGH	Temp. Range: 59-77°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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DV10

Strong fermenter for crisp, clean wines

Chardonnay, Sparkling Base, Gewürztraminer, Pinot gris, Late Harvest, Pinot blanc

LALVIN DV10™ is well known for clean fermentations that respect varietal character while avoiding bitter sensory contributions associated with other, more one-dimensional, 'work-horse' strains such as Prise de Mousse.

#15062	500 g	\$46.40
#15106	10 kg	\$564.20

Strong fermentation kinetics. Recognized for low foaming, low VA production and very low H₂S and SO₂ production. *Saccharomyces cerevisiae bayanus* strain from Epernay, France.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 50-95°F	Sensory: Neutral
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EC1118 (PRISE DE MOUSSE)

Original sparkling wine strain

Sparkling Base Wines

LALVIN EC1118™ is the original, steady, low-foamer yeast strain.

Ferments well at low temperatures and flocculates with compact lees.

Under standard winemaking conditions EC1118 has good compatibility with malolactic bacteria. Under low nutrient

#15053	500 g	\$29.30
#15076	10 kg	\$416.10

conditions EC1118 can produce high amounts of SO₂ (up to 50 ppm) and, as a result, may inhibit malolactic fermentation.

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.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 50-86°F	Sensory: Neutral
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ELIXIR

Varietal optimization in whites and rosés

Sauvignon blanc, Chardonnay, Viognier, Rosé, Rhône Whites, Aromatic Whites

VITILEVURE ELIXIR™ has enzymatic abilities which allows for the expression of terpenes and thiols revealing floral and fruity varietal aromas and stable esters.

Wines are aromatically complex, flavors persistent and mouthfeel is well-balanced.

Suitable for use in highly clarified juice.

#15214

500 g

\$49.40

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 57-77°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS
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Strain requires good nutrition and proper temperature control. It is a low SO₂, H₂S and volatile acidity producer.

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

EXOTICS MOSAIC

All-purpose hybrid yeast for fruity wines with mouthfeel

Chardonnay, Viognier, Chenin blanc, Syrah, Merlot, Tempranillo, Grenache

EXOTICS MOSAIC produces white wines with guava, passion fruit, tropical and stone fruit aromas and flavors as well as good mouthfeel. Red wines have cherry, floral, cocoa and strawberry aromas. Reds are full-bodied, well-balanced, complex and intense.

Wines fermented with EXOTICS MOSAIC take time to mature therefore this yeast is an excellent choice for wines destined for aging.

Steady fermenter but sensitive to cold temperatures. Can pro-

#15213

250 g

\$40.30

#15220

5 kg

\$701.30

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 64–83°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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duce 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)

EXOTICS NOVELLO

All purpose hybrid yeast for aromatic expression and mouthfeel

Sauvignon blanc, Viognier, Aromatic Whites, Merlot, Syrah, Fruity Reds

EXOTICS NOVELLO is known for enhancing mouthfeel, softness and aromas in white and red wines.

Fresh fruity thiols and floral esters are revealed in whites while astringency and bitterness is decreased. In red wines red and black fruits and spice are increased while green and vegetal characters are diminished.

EXOTICS NOVELLO produces low levels of VA and H₂S and has some pectinase activity.

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*.

Storage: 5-15°C(41-59°F)

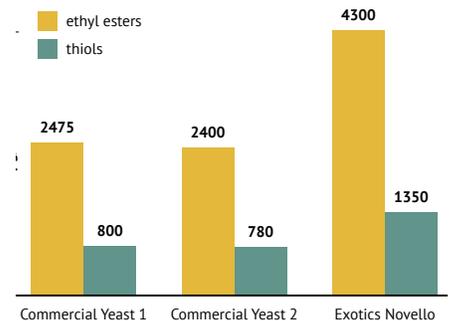
#15271

250g

\$40.30

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 62-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS, MOUTHFEEL
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Exotics Novello Impact on Esters & Thiols in Sauvignon blanc



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FERMIVIN CHAMPION



Fructophilic yeast for restarting stuck ferments

Restart Stuck Fermentations

FERMIVIN® CHAMPION has an excellent capacity to metabolize 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).

#17143	500 g	\$30.30
#17145	10 kg	\$423.20

FERMIVIN CHAMPION helps preserve the varietal character of the must/juice when restarting a stuck fermentation. Does not produce secondary aromas.

This *Saccharomyces cerevisiae bayanus* strain was selected in Alsace by INRA of Narbonne, France.

Alcohol Tolerance: 18%	Nitrogen Needs: MEDIUM	Temp. Range: 59-86°F	Sensory: Neutral
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FERMIVIN MT48



Fruity and spicy reds

Merlot, Sangiovese, Grenache, Tempranillo, Petit Verdot, Fruit Forward Reds

FERMIVIN® MT48 enhances aromatic notes of cherry, raspberry, blackberry, plum and spices in Bordeaux varieties. Produces excellent results in Sangiovese, Grenache and Tempranillo.

FERMIVIN MT48 has a short to medium lag phase, rapid and

#17106	500 g	\$46.40
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steady kinetics and low volatile acidity production.

High glycerol production.

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

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 68-86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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NEW

FERMIVIN SM102



Sweet and semi-sweet wine production

White, Rosé

FERMIVIN® SM102 produces delicate, aromatic wines that can be stopped easily making this strain ideal for sweet and semi-sweet wine production.

Renowned for its ability to produce delicate floral aromas and

#17140	500g	\$46.40
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flavors while respecting varietal aromas.

SM102 was originally isolated from the Cognac region and is easily stopped by alcohol levels beyond 12% or with chilling.

Alcohol Tolerance: 12%	Nitrogen Needs: MED	Temp. Range: 61-72°F	Sensory: ESTERS
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ICV D21



Freshness and mouthfeel for mature and concentrated reds and whites

Merlot, Syrah, Zinfandel, Cabernet Sauvignon, Chardonnay, Structured Reds

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 polyphenol-reactive polysaccharides leading to a more stable aromatic profile in the mouth.

ICV D21 can be used with ripe white grapes to develop fresh fruit aromas, volume and perceived acidity. Suitable for barrel fermentation.

#15143	500 g	\$46.40
#15163	10 kg	\$564.20

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's (ICV) Natural Micro-Flora Observatory and Conservatory in France.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 61-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ICV D47

Complex whites with citrus and floral expression

Chardonnay, Rosé, Rhône Whites

LALVIN ICV D47™ is known for the production of full-bodied, complex white wines with fruity and floral notes.

ICV D47 is a high polysaccharide and ester producing strain suitable for both tank and barrel-fermented white and rosé wines.

This yeast has a short lag phase and regular fermentation rate. Can tolerate a fermentation temperature range of 15-28°C (60-

#15642	500 g	\$46.40
#15643	10 kg	\$564.20

82°F), however a temperature of 17-20°C (63-68°F) is preferred, especially at the end of fermentation.

The freshness from wines made using LALVIN ICV D21™ make for an ideal post-fermentation blending component.

This yeast was isolated from Suze-la-Rousse in the Côte du Rhone region of France.

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 60–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ICV D80

Enhances tannin structure in reds

Cabernet Sauvignon, Merlot, Syrah, Zinfandel, Petite Sirah, Structured Reds

LALVIN ICV D80™ complements big tannin volume, ripe fruit, and licorice style reds.

Selected for its ability to bring out varietal aromas and reinforcing the rich concentrated flavors found in varieties such as Zinfandel and Syrah where wines have a high fore-mouth volume, big mid-palate mouthfeel and intense fine-grain tannins.

#15125	500 g	\$46.40
#15133	10 kg	\$564.20

ICV D80 is a rapid starter with a moderate fermentation rate. Excellent for blending with wines fermented with LALVIN ICV D254™.

This strain was isolated by the Institut Coopératif du Vin (ICV) in 1992 from the Côte Rôtie area of the Rhône Valley in France.

Alcohol Tolerance: 16%	Nitrogen Needs: HIGH	Temp. Range: 59–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ICV D254

Mouthfeel and balance in reds and whites

Cabernet Sauvignon, Syrah, Zinfandel, Sangiovese, Chardonnay, Petit Verdot, Malbec, Rhône Whites

In red wines, LALVIN ICV D254™ develops ripe fruit, jam and cedar aromas together with mild spiciness.

On the palate it contributes high fore-mouth volume, big mid-palate mouthfeel and intense fruit concentration.

#15094	500 g	\$46.40
#15021	10 kg	\$564.20

When used for white wines (particularly Chardonnay), sensory descriptors include butterscotch, hazelnut and almond.

This strain was isolated by the Institut Coopératif du Vin (ICV) from a Rhône Valley Syrah fermentation.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 54–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ICV GRE

Fruit forward reds and whites

Chenin blanc, Riesling, Rosé, Rhône Whites, Rhône Reds, Fruit Forward Reds

In fruit-focused whites, such as Chenin blanc, Riesling and Rhône whites, LALVIN ICV GRE™ fermentations result in stable, fresh fruit characteristics such as melon and apricot with improved fore-mouth volume.

In reds, ICV GRE complements up-front fruit for easy-to-drink Rhône-style wines. With short skin contact (three to

#15101	500 g	\$46.40
#15142	10 kg	\$564.20

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 SO₂, volatile acidity and foam production.

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 59–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ICV OKAY

Strong fermenter for sulfur management and fruity esters

Petit Sirah, Rosé, Syrah, Viognier

LALVIN ICV OKAY™ is recommended for fresh and aromatic red, white or rosé wines with good fruit intensity.

Very short lag phase with steady fermentation kinetics and good fermentation security. Low foam production.

#15221	500 g	\$30.30
#15222	10 kg	\$444.40

ICV OKAY has very good synergy with malolactic bacteria.

This *S. cerevisiae* hybrid was selected in collaboration with the INRA, SupAgro Montpellier, the ICV and Lallemant Oenology for very low to no SO₂, H₂S, and acetaldehyde production.

Alcohol Tolerance: 16%	Nitrogen Needs: LOW	Temp. Range: 54–86°F	Sensory: ESTERS
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ICV OPALE 2.0

Sulfur compound management in aromatic wines

Chardonnay, Sauvignon blanc, Rosé, Rhône Whites

LALVIN ICV OPALE 2.0™ respects varietal characteristics while producing intense and complex fruit aromas in white and rosé wines.

Wines fermented with ICV OPALE 2.0 gives the initial impression of volume and softness, followed by a round intense mid-palate and balanced finish.

#15065	500 g	\$46.40
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ICV OPALE 2.0 has excellent fermentation qualities with a short lag phase, even in high-maturity/high Brix grapes, with no to very low SO₂, H₂S and acetaldehyde production.

Alcohol Tolerance: 14%	Nitrogen Needs: LOW	Temp. Range: 59–86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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NEW

ICV SUNROSE

Complex and elegant rosé wines

Rosés

LALVIN ICV SUNROSE™ is recommended for rosé wines that are red fruit and blackcurrant focused.

ICV SUNROSE produces elegant and complex wines with a balanced, round mouthfeel.

#15280	500 g	\$46.40
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This strain has excellent implantation rates and low volatile acidity production even in high Brix grapes.

This strain from the Institut Coopératif du Vin (ICV) is especially suitable for rosé wines from warm climates.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 57–68°F	Sensory: ESTERS, MOUTHFEEL
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IOC BE FRUITS

Sulfur management and fruity esters for whites and rosés

Albariño, Rosé

IOC BE FRUITS™ produces fruity esters (strawberry, pineapple, citrus notes) in white and rosé wines without masking varietal aromas. Fruit expression is emphasized due to the yeast's very low to no sulfite and acetaldehyde production.

Optimal conditions for fruity ester production are achieved

#15241	500 g	\$46.40
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when must/juice is clarified (80 NTU ± 20) and fermentation temperatures are between 12–15°C (54–59°F).

BE FRUITS™ has a short lag phase and low volatile acidity production. This hybrid yeast strain was selected by INRA for very low to no SO₂ or H₂S production.

Alcohol Tolerance: 14%	Nitrogen Needs: LOW	Temp. Range: 54–75°F	Sensory: ESTERS
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IOC BE THIOLS

Sulfur management and thiol revelation
Sauvignon blanc, Riesling, Gewürztraminer, Rosé

#15247	500 g	\$46.40
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IOC BE THIOLS™ reveals fruity thiols (citrus and exotic fruits) in white and rosé wines. It enhances 3MH potential (grapefruit, passion fruit) without excessive green flavors. The purity of the fruity expression is heightened by this strain's inability to produce negative sulfur compounds that can mask aromas.

must/juice is clarified (80 NTU ± 20), pH >3.2, and fermentation temperatures are between 15–20°C (59–68°F).

BE THIOLS is a fast fermenter with a short lag phase. This hybrid yeast strain was selected by INRA for very low to no SO₂ or H₂S production.

Optimal conditions for expressing fruity thiols occur when

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 59-77°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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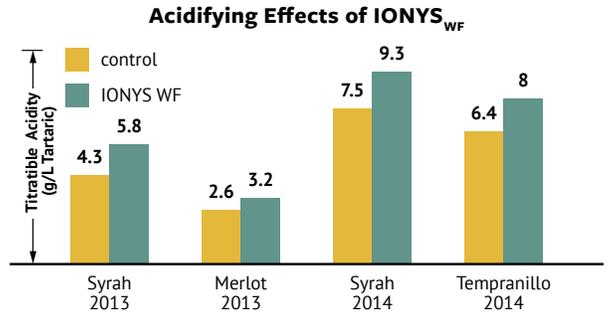
IONYS_{WF}

Acid production and mouthfeel enhancement
Malbec, Petite Sirah, Sangiovese, Syrah, Tempranillo, Cabernet Sauvignon, Merlot, Petit Verdot

#15233	500 g	\$55.50
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IONYS_{WF}™ is a selected wine yeast that naturally increases the acidity of wines.

IONYS_{WF} is recommended for fermenting reds from warmer climates with high pH and high potential alcohol. The acidification 'power' of IONYS_{WF} can result in a titratable acidity increase of 0.4–1.4 g/L and a pH decrease of between 0.04–0.2. With proper nutrition and temperature control, wines made with IONYS_{WF} are characterized as having fresh fruit and mineral characters and fine-grain tannins.



Moderate fermentation speed with a long, but steady stationary phase. IONYS_{WF} has very high nitrogen requirements and a balanced nutrient protocol is essential. Low producer of volatile acidity, SO₂ and H₂S, with an alcohol tolerance of up to 16% (v/v). Maintaining a temperature range of 25–28°C (77–82°F) optimizes glycerol production (up to 15 g/L) and may decrease alcohol production by 0.4–0.8% (v/v).

Storage: 4-11°C (39-52°F).

Note: IONYS_{WF} is an innovative yeast selection and is protected by an International Patent pending; No WO2015/11411. Propagation of IONYS_{WF} is an infringement of this Patent.

Alcohol Tolerance: 16%	Nitrogen Needs: VERY HIGH	Temp. Range: 77–82°F	Sensory: MOUTHFEEL
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K1 (V1116)

Strong fermenter for ester production and challenging conditions
Fruity whites, Chenin blanc

#15063	500 g	\$28.30
#15077	10 kg	\$272.10

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.

Alcohol Tolerance: 18%	Nitrogen Needs: LOW	Temp. Range: 50–95°F	Sensory: ESTERS
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M83

Provence style rosés
Rosé

#15674	500 g	\$49.40
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VITILEVURE M83™ produces round and balanced rosés with enhanced fresh fruit aromas.

warmer regions. It has good implantation, strong fermentation kinetics, and low volatile acidity and SO₂ production.

Increases color stability as a result of its polysaccharide production. M83 is particularly well adapted for rosé winemaking in

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

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 63–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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MSB 

Enhances Sauvignon blanc varietal characters

Sauvignon blanc, Colombard

#15267

500 g

\$46.40

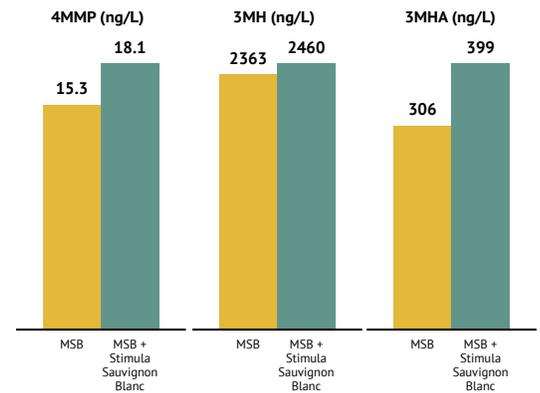
LALVIN MSB™ enhances fruity, tropical and citrus notes while maintaining a balanced mouthfeel.

Sauvignon blanc and other aromatic white wines fermented using MSB maintain their freshness due to negligible malic acid uptake.

This *Saccharomyces cerevisiae bayanus* strain was isolated from the Marlborough Valley in New Zealand by the Lallemend Oenology R&D team.

To optimize thiol uptake and bioconversion MSB should be rehydrated with GO-FERM PROTECT EVOLUTION™ and nourished with STIMULA SAUVIGNON BLANC™ (see pgs 46 and 48 for more information).

Effect of STIMULA SAUVIGNON BLANC™ on Thiol Production in a Wine Fermented with LALVIN MSB™



Alcohol Tolerance: 14.5%	Nitrogen Needs: MEDIUM	Temp. Range: 57-68°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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MT 

High maturity, long-aging Bordeaux varieties

Merlot, Cabernet Sauvignon, Petit Verdot, Structured Reds

#15650

500 g

\$49.40

#15651

10 kg

\$596.50

VITILEVURE MT™ is known for producing wine aromas of strawberry and caramel, especially in Merlot and is recommended for grapes with high maturity and long aging potential.

Wines have good color intensity and tannin structure.

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

MT was selected in Saint-Émilion, France, by the IFV (formerly ITV) Bordeaux in collaboration with the INRA Montpellier.

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 59-90°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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NT 116 

All-purpose strain for New World style whites and reds

Syrah, Cabernet Sauvignon, Merlot, Petite Sirah, Pinot gris, Aromatic Whites

#15185

1 kg

\$94.80

#15226

10 kg

\$677.10

NT 116 is equally suited for both white and red winemaking due to its release of varietal aromas, glycerol and mannoproteins giving aromatically complex, round wines.

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 zesty aromas.

Also suitable for full-bodied, high maturity red wines destined

for oak aging.

Temperature control is advised when using this low foaming but vigorous strain.

This 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.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 54-83°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS, MOUTHFEEL
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NT 202 

Structured and complex reds

Cabernet Sauvignon, Pinot noir, Merlot, Malbec, Structured Reds

#15191

1 kg

\$94.80

#15227

10 kg

\$677.10

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

This strain has good fructose utilization and encourages malolactic fermentation. Fermentation temperature should be monitored to control fermentation speed.

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.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 64-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS
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PERSY LALLEMAND YSEO

Sulfur management, fruity aromas and mouthfeel in red wines

Rhône reds, Pinot noir, Tempranillo or other varieties susceptible to hydrogen sulfide production

Red wines fermented with LALVIN PERSY™ have persistent fruit forward aromas and flavors optimizing varietal expression.

Wines have a balanced mouthfeel with good entry and mid-palate and integrated tannins.

Using good fermentation practices, PERSY produces very low

#15261	500 g	\$46.40
#15262	10 kg	\$564.20

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 Oenology.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 59–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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QA23 LALLEMAND YSEO

Strong fermenter for varietal expression in highly clarified musts

Chardonnay, Sauvignon blanc, Gewürztraminer, Pinot blanc, Albariño, Muscat, Aromatic Whites

LALVIN QA23™ is an excellent thiol converter making it a complementary yeast for developing varietal Sauvignon blanc passion fruit character.

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

#15652	500 g	\$49.40
#15653	10 kg	\$596.50

QA23 has low nutrient and oxygen requirements and can ferment juice with low turbidity at low temperatures to dryness.

This strain was selected in Portugal by the University of Trás-os-Montes and Alto Douro (UTAD) in cooperation with the Viticultural Commission of the Vinho Verde region.

Alcohol Tolerance: 16%	Nitrogen Needs: LOW	Temp. Range: 59–90°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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R2 LALLEMAND

Expression of varietal aromas at cold temperatures

Riesling, Sauvignon blanc, Gewürztraminer, Late Harvest, Aromatic Whites

LALVIN R2™ can enhance varietal characters due to the enzymatic release of aroma precursors producing intensely aromatic white wines 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

#15071	500 g	\$46.40
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produce VA without proper nutrition, or when stressed.

This *Saccharomyces cerevisiae bayanus* strain was isolated in the Sauternes region of Bordeaux, France, by Brian Croser of South Australia.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 50–86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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RC212 (BOURGOROUGE) LALLEMAND

Enhanced structure and color in Pinot noir

Pinot noir, Grenache, Rosé

LALVIN RC212 (Bourgorouge)™ is known for its ability to generate ripe berry, bright fruit and spicy characteristics and to consistently produce Pinot noir with good tannin structure.

RC212 requires thoughtful nutrient additions to avoid potential hydrogen sulfide production.

#15057	500 g	\$46.40
#15097	10 kg	\$564.20

Wines fermented with RC212 can be blended with wines fermented with ENOFERM AMH™, LALVIN W15™ or LALVIN BRL97™ to achieve more complexity.

This *S. cerevisiae cerevisiae* strain was selected from fermentations in Burgundy, France, by the BIVB.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 60–86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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RHÔNE 2226 
(formerly L2226)

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

Wines made using LALVIN RHÔNE 2226™ have intense color and aromas of black cherry, berries and cherry cola.

This yeast contributes to wine quality by enhancing varietal characters and tannin structure in red wines from warm and hot climate fruit.

#15644	500 g	\$46.40
#15645	10 kg	\$564.20

RHÔNE 2226™, in addition to its high alcohol tolerance, has a short lag phase and high fermentation vigor. When used in high maturity fruit ensure nutrition is adequate.

This strain was isolated from a vineyard in the Côtes du Rhône region of France.

Alcohol Tolerance: 18%	Nitrogen Needs: HIGH	Temp. Range: 59-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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RHÔNE 4600 

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

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).

#15171	500 g	\$46.40
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Higher roundness with diminished bitterness makes this strain a good choice for Chardonnay.

RHÔNE 4600 has a short lag phase. May produce low levels of SO₂ and H₂S under conditions of stress. Very malolactic friendly. Isolated from a Viognier fermentation in the Côtes du Rhône region of France in collaboration with Inter-Rhône technical department.

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 56-72°F	Sensory: ESTERS
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R-HST 

Strong fermenter for Riesling and other aromatic whites
Riesling, Gewürztraminer, Sauvignon blanc, Viognier, Rhône Whites, Aromatic Whites

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.

#15130	500 g	\$46.40
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Short lag phase and generation time, even at cold temperatures. R-HST dominates and persist over spoilage yeast such as *Kloeckera apiculata*.

This strain was selected from Riesling trials conducted in the Heiligenstein region of Austria.

Alcohol Tolerance: 15%	Nitrogen Needs: MEDIUM	Temp. Range: 50-86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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RP15 

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

ENOFERM RP15™ is recommended for medium to full-bodied red wines 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. Helps to stabilize color.

#15665	500 g	\$49.40
#15666	10 kg	\$596.50

Rehydrating the yeast in GO-FERM PROTECT EVOLUTION™ (see pg 46) tends to improve the aromatic profile of this yeast.

This strain was isolated from spontaneous Rockpile Syrah fermentations in California.

Alcohol Tolerance: 17%	Nitrogen Needs: MEDIUM	Temp. Range: 68-86°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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SAUVY 
For mega expression of grassy thiols
 Sauvignon blanc, Chenin blanc

#15258	500 g	\$50.40
#15272	10 kg	\$608.60

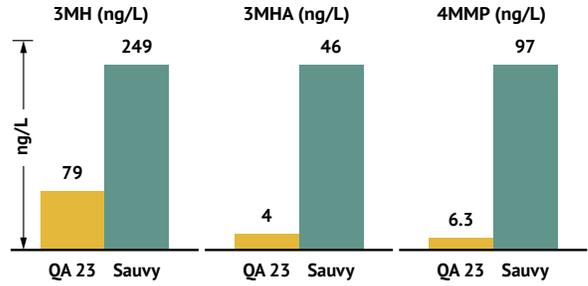
SAUVY™ was selected to help winemakers make an intensely aromatic and fresh white wine.

SAUVY has a remarkable ability to uptake and reveal volatile thiols, especially 4MMP (passion fruit/box wood/gooseberry). The resulting wines are exceptionally aromatic and can be over-the-top, making SAUVY an excellent blending component especially in grapes from cooler regions.

In warmer regions, or in grapes where there are low levels of 4MMP, the resulting wine still express the green thiol (box wood/gooseberry) character but have a more balanced aromatic profile, especially when used in conjunction with the yeast nutrient STIMULA SAUVIGNON BLANC™. In this scenario wines made using SAUVY are fruity, crisp and refreshing.

SAUVY produces very low to no H₂S, SO₂ and volatile acidity.

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



Alcohol Tolerance: 14%	Nitrogen Needs: MEDIUM	Temp. Range: 57-68°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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 **SENSY** 
Sulfur management and aromatic finesse for whites and rosés
 Rosé, Chardonnay, Sauvignon blanc, Pinot blanc

#15225	500 g	\$46.40
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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 add-

ing >50 ppm SO₂ at the crusher.

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

Alcohol Tolerance: 15%	Nitrogen Needs: LOW	Temp. Range: 54-64°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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SYRAH 
Spicy, fruity and floral reds
 Syrah, Merlot, Mourvedre, Petite Sirah, Petit Verdot, Structured Reds

#15657	500 g	\$49.40
#15658	10 kg	\$596.50

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, strawberries 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.

Alcohol Tolerance: 16%	Nitrogen Needs: MEDIUM	Temp. Range: 59-90°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
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T73

Strong fermenter for varietal complexity in high-alcohol reds
Merlot, Zinfandel, Sangiovese, Tempranillo, Fruit Forward Reds

#15091 | 500 g | \$46.40

LALVIN T73™ is recognized for its ability to enhance natural aromas and flavors in red wines produced in hot climates. Its well-balanced production of esters and higher alcohols help hot climates wines “open up”.
Mouthfeel is enhanced through the production of glycerol.

T73 shows good resistance to anti-fungal vineyard treatments, has extremely low nitrogen demand, and dominates against indigenous microflora.
This yeast strain was isolated by La Universidad de Valencia of Spain in collaboration with Lallemand Oenology.

Alcohol Tolerance: 16%	Nitrogen Needs: LOW	Temp. Range: 65-90°F	Sensory: ESTERS, MOUTHFEEL
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TANGO MALBEC

Balanced reds with perception of sweetness
Malbec, Syrah, Tempranillo, Merlot, Petite Sirah

#15252 | 500 g | \$46.40

LALVIN TANGO MALBEC™ respects varietal characteristics producing full-bodied red wines with aromatic complexity including flavors of violet, black cherry, blackberry, raspberry, dark plum and anise.
TANGO MALBEC’s interactions with polyphenolic compounds creates wines with intense color, good structure, bal-

ance 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.

Alcohol Tolerance: 15.5%	Nitrogen Needs: MEDIUM	Temp. Range: 59-82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS
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VIN 13

Strong fermenter for thiol expression
Sauvignon blanc, Chenin blanc, Chardonnay, Rosé, Gewürztraminer, Muscat, Albariño, Aromatic Whites

#15183 | 1 kg | \$94.80
#15228 | 10 kg | \$677.10

VIN 13 is a very good thiol releaser (guava, passion fruit and grapefruit) and outstanding ester producer. In tank-fermented Chardonnay VIN 13 promotes pineapple and banana flavors, while on Riesling, Gewürztraminer and Viognier it accentuates floral notes.
Aromatic as well as cold tolerant it is favored for its ease of

use and robustness, making this strain suitable for challenging winemaking conditions.
Temperature control is advised. Do not over inoculate. This hybrid yeast strain is a product of the yeast hybridization program at the Institute for Wine Biotechnology, University of Stellenbosch in South Africa.

Alcohol Tolerance: 17%	Nitrogen Needs: LOW	Temp. Range: 54-61°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS
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VIN 2000

Full-bodied aromatic whites
Chenin blanc, Chardonnay, Viognier, Albariño

#15195 | 1 kg | \$94.80

VIN 2000 is recommended for the production of rich and ripe style Chenin blanc (fresh pineapple and citrus aromas), oaked Chardonnay (citrus aromas) and Sauvignon blanc (passion fruit, guava and tropical aromas).
Moderate speed fermenter with very low SO₂ production and

low foaming making VIN 2000 suitable for barrel fermentation. This hybrid yeast strain is a product of the yeast hybridization program at the Institute for Wine Biotechnology, University of Stellenbosch in South Africa.

Alcohol Tolerance: 15.5%	Nitrogen Needs: LOW	Temp. Range: 55-61°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, ESTERS
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Let's Start
Vineyard
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VRB 

Balance and mouthfeel in high alcohol reds

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

UVAFERM VRB™ helps express varietal characteristics and ester production in wines such as Tempranillo, Barbera, and Sangiovese. These wines are described as having flavors of ripe fruit, jam, hazelnut and dried plums.

VRB can soften tannins and add flavor complexity with good

#15173

500 g

\$46.40

mid-palate volume. Wines tend to have good color intensity and stability with good polyphenolic structure.

VRB softens high acid musts by partially metabolizing malic acid.

VRB was selected by Centro de Investigaciones Agrarias (CIDA) in Logroño, Spain.

Alcohol Tolerance: 17%	Nitrogen Needs: MEDIUM	Temp. Range: 59–82°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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W15 

Ferments cleanly at low temperatures

Gewürztraminer, Riesling, Pinot gris, Pinot noir, Syrah, Rosé, Aromatic Whites

In white wines, LALVIN W15™ helps retain bright fruit characters while optimizing mouthfeel and balance. Performs well in Pinot noir and cooler climate Syrah.

Produces glycerol and succinic acid, especially when fermented between 15–20°C(59–68°F), adding complexity to the mid-palate.

#15118

500 g

\$46.40

#15119

10 kg

\$564.20

Low heat generation during fermentation helps winemakers minimize the potential for temperature spikes and possible H₂S problems.

Isolated in 1991 at the Swiss Federal Research Station in Wädenswil, Switzerland.

Alcohol Tolerance: 16%	Nitrogen Needs: HIGH	Temp. Range: 50–81°F	Sensory: ENHANCED VARIETAL CHARACTERISTICS, MOUTHFEEL
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ARTICLE WHAT ARE HYBRID YEAST AND WHY ARE THEY SO EXCITING?

Hybrid yeast can occur in nature when organisms are present in the same ecological niche. By definition, a hybrid is an organism that contains genomic DNA from two or more hereditarily distinct parents.

Yeast reproduce in two ways: sexually and asexually. Under winemaking conditions, yeast will always ferment rather than respire and they will always reproduce asexually. This is due to a phenomenon called glucose catabolite repression (a.k.a. Crabtree effect). In nature however, under conditions of nutrient starvation, yeasts can reproduce sexually to ensure survival of the species. This produces genetically diverse populations. Hybridization is an essential part of this sexual reproduction cycle. Sexual reproduction can be induced in a laboratory (a completely non-GMO process), and just like in nature, new yeast hybrids from different parental strains are obtained. This allows for the selection of hybrid strains that represent the most desired characteristics of the parent strains e.g., strong fermentation kinetics and high aroma production. This process is possible between different

yeast species within the same genus, i.e., 2 *Saccharomyces* species. Such hybrids are called inter-species hybrids. Recent research focusing on inter-genus hybrids could bring even more diversity and enologically interesting traits.

The non-GMO, inter-species yeast strains in the Scott Laboratories' portfolio are highlighted in the yeast selection charts (pgs 12-17) and were introduced many years ago due their strong fermentation kinetics and their interesting metabolic profiles. One of the first strains introduced was, the reliable and intensely aromatic VIN 13. Since VIN 13's introduction we have included more strains for a total of 14. These strains were introduced due to their increased aroma production (e.g., EXOTICS NOVELLO, ELIXIR™), ability to break down small amounts of pectin (EXOTICS MOSAIC) and inability to produce H₂S or SO₂ through primary pathways (LALVIN PERSY™, IOC BE THIOLS, and LALVIN ICV OPALE 2.0™). Hybrid yeast strains are robust and reliable fermenters that bring safety, security and aromatic intensity to today's winemaker.

NON-SACCHAROMYCES YEAST

“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 ethyl acetate and other undesirable characters, 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 **bioprotectants**, to **preserve and 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* yeast to complete the alcoholic fermentation.

SELECTING NON-SACCHAROMYCES YEAST FOR SUCCESS

Non-Saccharomyces	BIODIVA™	FLAVIA™	GAIA™	INITIA™	LAKTIA™
Organism	<i>Torulaspora delbrueckii</i>	<i>Metschnikowia pulcherrima</i>	<i>Metschnikowia fructicola</i>	<i>Metschnikowia pulcherrima</i>	<i>Lachancea thermotolerans</i>
Main activity	Produces polysaccharides and aroma compounds (esters). Consumes some sugar to alleviate osmotic (high sugar) stress on <i>Saccharomyces</i>	Enzyme production to cleave aroma precursors to reveals terpenes and thiols	Bioprotectant against VA producing native microflora	Utilizes oxygen as a growth factor, acts as a bioprotectant inhibiting VA producing native microflora	Converts glucose to lactic acid
Winemaking application	To enhance the mouthfeel, fruit esters and complexity of white, rosé and red wines. Suitable for late harvest, ice-wine and high sugar where VA can be a challenge	Optimize the tropical, citrus and floral notes of certain white and rosé wines	Can be added to white or rosé juices for protection during transportation. Can be added to red grapes to protect during transportation or cold soak	Scavenges oxygen thereby protecting white and rosé juice from oxidative damage and microbial spoilage	Acidification of low acid musts adding freshness and complexity
When to add Non-Saccharomyces	Directly to the fermentation vessel	Directly to the fermentation vessel	Directly to grapes (to protect during transport or cold soak) or juice (protect during juice transport)	To freshly pressed juice to protect during cold settling	Directly to the fermentation vessel
When to add <i>Saccharomyces</i>	After 1.5–3°Brix drop	24 hours after Flavia	Upon juice receipt, or end of cold soak	Once juice racked to fermentation vessel	24–72 hours after Laktia
Suggested compatible <i>Saccharomyces</i> strains	Any strain that meets your winemaking goal	Strains with β -glucosidase activity (Denoted as strains that enhance varietal characters)	Any strain that meets your winemaking goal. 3001 is specifically recommended for use in Pinot noir musts that have undergone cold soak	Any strain that meets your winemaking goal	Any strain that meets your winemaking goal

BIODIVA 
Torulaspora delbrueckii

15697 | 500g | \$109.90

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

LEVEL² BIODIVA™ is a pure culture of *Torulaspora delbrueckii* that can enhance the aroma profile and complexity of wines (see Figure). This non-Saccharomyces yeast is an ester producer and can also produce components that lead to a fuller mouthfeel. BIODIVA is osmotolerant making it a good choice for high sugar fermentations, late harvest and icewine production as it will consume some sugar alleviating some of the stress on *Saccharomyces*. This can result in lower final volatile acidity levels.

Usage: Prior to inoculation ensure the free SO₂ <15ppm, turbidity >80 NTU, YAN >150ppm and inoculation temperature >16°C (61°F)*. Rehydrate BIODIVA 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.

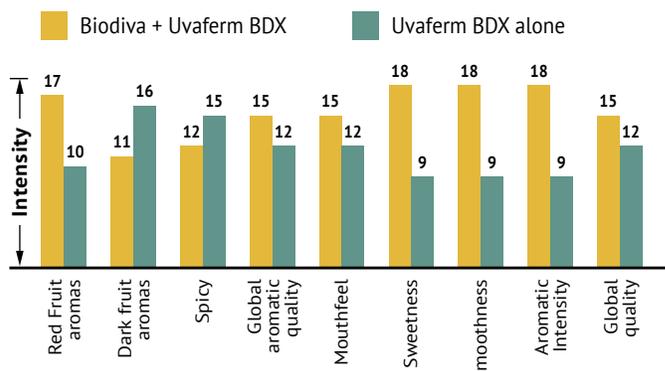
After 1.5–3°Brix drop a compatible *S. cerevisiae* strain should be inoculated following the recommended *Saccharomyces* rehydration protocol (see pg 38).

*If the must is <16°C (61°F) you may observe a long lag phase.

Storage: Store at 20°C (68°F). Once opened use immediately.

Recommended Dosage	250ppm	25g/hL	2 lb/1000 gal
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Impact of BIODIVA on Sensory Perception of a Merlot by 27 Tasters



Impact: Rounder, fruitier, more complex wines due to over-production of polyols and esters

Add *Saccharomyces*: After 2–3°Brix drop

Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
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FLAVIA

Metschnikowia pulcherrima

For revelation of terpenes and thiols in aromatic whites and rosés

LEVEL2 FLAVIA™ is a pure culture of *Metschnikowia pulcherrima* used for its ability to liberate bound terpenes and thiols.

Bound terpenes and thiols are odorless and flavorless but become odor-active once enzymatically released.

FLAVIA, along with a compatible strain of *S. cerevisiae*, has the enzymatic ability to release terpenes and thiols in the juice, thereby elevating the varietal characteristics of the wine.

Wines made using FLAVIA have increase floral (see Figure), tropical and citrus aromas.

An additional benefit of FLAVIA is its ability to suppress the growth of indigenous yeast and bacteria. This bioprotective effect means that FLAVIA can help to minimize microbial spoilage of aromatic white and rosé juice.

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

Usage Prior to inoculation ensure the free SO₂ <10ppm and YAN >150ppm. Rehydrate FLAVIA 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 juice temperature, however, the process should not exceed 45 minutes. If the initial YAN is

15244

500g

\$109.90

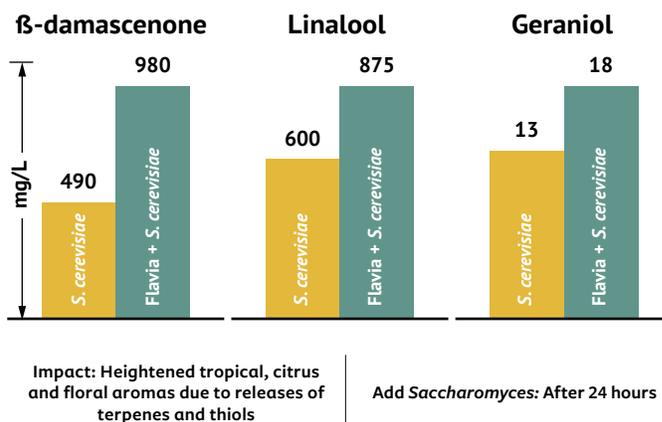
<150ppm we recommend using GO-FERM PROTECT EVOLUTION™ (see pg 38) during the FLAVIA rehydration.

After 24 hours a compatible *S. cerevisiae* strain should be inoculated, even if there has been no change in °Brix.

Storage: Store for 24 months at 4-11°C(39-52°F). Once opened use immediately.

Recommended Dosage	250ppm	25g/hL	2 lb/1000 gal
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Impact of FLAVIA on Floral Aromatics



GAIA

Metschnikowia fructicola

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

GAIA™ is a non-fermentative yeast that implants and multiplies quickly, controlling the production of ethyl acetate and acetic acid from *Kloeckera apiculata* (see Figure), acetic acid bacteria, and other native microflora during the pre-fermentative stage. GAIA can protect grapes and juice during transport or during pre-fermentation cold soak. This bioprotective effect can last up to five days if the temperature is <10°C(50°F). Although GAIA was selected for its use as a bioprotectant, it can also help to preserve fruit characteristics and aroma.

Usage: Prior to inoculation ensure the total SO₂ is <50ppm. Rehydrate GAIA 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.

Upon juice receipt or once cold soak has been completed, a compatible *S. cerevisiae* strain should be added following the recommended *Saccharomyces* rehydration protocol (see pg 38).

Storage: Store for 24 months at 4-11°C(39-52°F). Once opened use immediately.

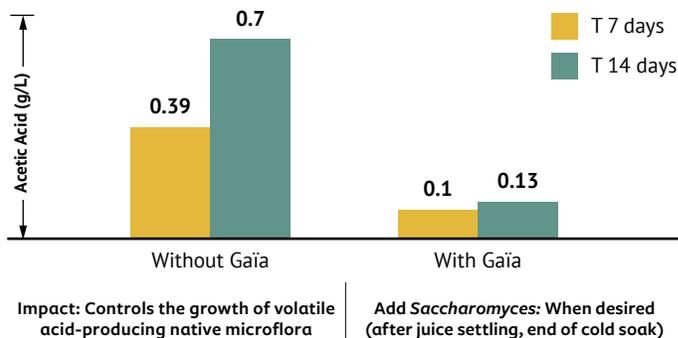
15686

500g

\$109.90

Recommended Dosage	250ppm	25g/hL	2 lb/1000 gal
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Effect of GAIA™ on Acetic Acid Production in Must Inoculated with *Kloeckera apiculata*



NEW

INITIA LALLEMAND

Metschnikowia pulcherrima

Protects aromas and color from oxidative damage in aromatic whites and rosés

LEVEL² INITIA™ is added into the press or to freshly pressed white or rosé juice where it quickly consumes oxygen thereby protecting the juice from oxidative browning. Using INITIA during pre-fermentation results in enhanced wine quality with fresher aromatics (see Figure) and brighter colors. INITIA's fast oxygen consumption also protects juice from oxidative yeast and acetic acid bacteria. This secondary bioprotective effect means that juice quality is preserved.

INITIA is a pure culture of *Metschnikowia pulcherrima* that was selected by Vincent Gerbaux at the Institut Français de la Vigne (IFV) in Beaune, France. This non-*Saccharomyces* yeast has very low fermentative abilities therefore inoculation with a selected *Saccharomyces* strain and a balanced fermentation nutrition strategy is necessary to complete alcoholic fermentation.

Usage: Prior to inoculation ensure that free SO₂ is < 15ppm, temperature 4-20 °C(39-68°F) and YAN >150ppm. Rehydrate INITIA in ten times its weight of chlorine free, 20-30°C(68-86°F) water and stir gently. After 15 minutes stir gently again. Slowly combine some of the juice with the rehydrated yeast to drop the temperature 10°C(18°F) and hold for 15 minutes. This step may be repeated until you are within 10°C(18°F) of the juice temperature, however the process should not take more than 45 minutes. Add rehydrated INITIA to the press pan as the juice is on route to the settling tank.

Once the juice has been racked to the fermentation vessel, a *Saccharomyces* strain should be added following the recommended *Saccharomyces* rehydration protocol (see pg 38) and using GO-

#15273	500g	\$109.90
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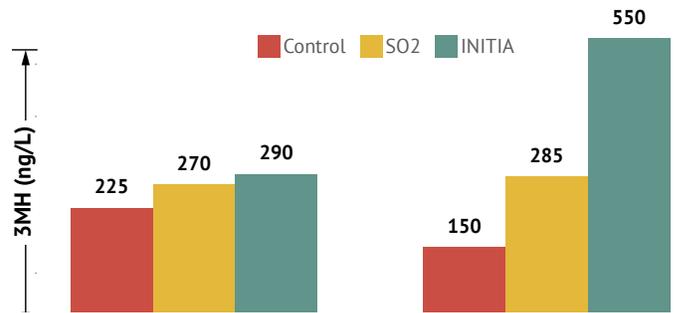
FERM PROTECT EVOLUTION™. Due to the possible consumption of nutrients by INITIA, YAN should be measured and supplemented as necessary when *Saccharomyces* is inoculated.

Storage: Dated expiration. Store in a dry environment at 4°C (39°F). Once opened, use immediately.

Recommended Dosage	250ppm	25g/hL	2 lb/1000 gal
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Preservation of Varietal Aromas (volatile thiols)

Sauvignon blanc 2019 (Bordeaux, France) Grenache Rosé 2019 (Provence, France)



Impact: Depletes oxygen from juice resulting in improved wine quality with better aromas and brighter colors

Add *Saccharomyces*: Once racked to fermentation tank

LAKTIA LALLEMAND

Lachancea thermotolerans

Naturally acidifies grapes lacking acidity

LEVEL² 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 (see Figure). LAKTIA is recommended for red musts but has also been used successfully in whites and rosés.

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 bacteria.

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 24-72 hours a compatible *S. cerevisiae* strain should be inoculated following the recommended *Saccharomyces* rehydration protocol (see pg 38) and using GO-FERM PROTECT EVOLUTION™. Due to consumption of nitrogen by LAKTIA,

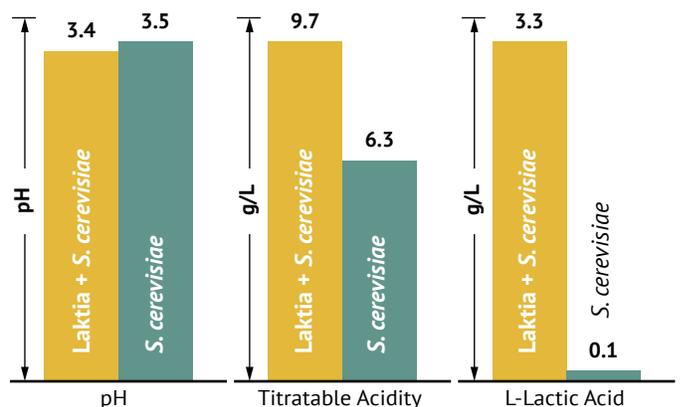
# 15253	500g	\$109.90
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YAN should be measured and supplemented as necessary when *Saccharomyces* is inoculated.

Storage: Store at 20°C(68°F). Once opened use immediately.

Recommended Dosage	250ppm	25g/hL	2 lb/1000 gal
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Impact of LAKTIA on Acidity in a 2017 Tempranillo



Impact: Adds freshness due to lactic acid production

Add *Saccharomyces*: After 24-72 hours

Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
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HOW TO

SACCHAROMYCES YEAST REHYDRATION

Proper yeast rehydration is one of the most important steps to ensure a strong and healthy fermentation. The 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, attemperation, inoculation and homogenization are all important to help prevent sluggish or stuck fermentations.

Note: This protocol is not appropriate for non-*Saccharomyces* yeast. Please see individual product descriptions for rehydration guidelines (pgs 35-37).

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 pg 46-47 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.
3. Slowly (over a period of 5 minutes) combine an equal amount of the must/juice to be fermented with the yeast suspension. This will help the yeast adjust to the high sugar conditions and the cooler temperature of the must/juice. This step is essential as it will help to avoid cold shock caused by a rapid temperature drop exceeding 10°C (18°F). This attemperation step may need repeating for very low temperature must/juice. Each attemperation step should last about 15–20 minutes. For every 10°C (18°F) temperature difference between the must/juice and the yeast slurry, an attemperation step must be performed. For example, for a must/juice temperature of 20°C (68°F) and yeast slurry temperature of 40°C (104°F), two attemperation steps are required.
4. For direct inoculation of yeast post rehydration, ensure you mix the yeast slurry into the full volume of the must/juice.
5. For large tanks with long filling times add the yeast slurry to the bottom of the fermentation vessel just as you begin filling with must/juice. This is especially important when inoculating with strains that are sensitive to the competitive factor (refer to pg 12-17 for individual yeast strain information). This allows the yeast a head start over indigenous organisms.

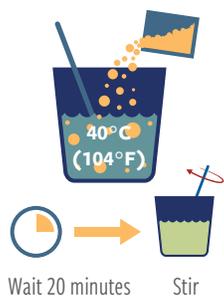
Note: Copies of “Easy Steps for Optimal Yeast Rehydration” may be downloaded in Spanish and English from our website (scottlab.com).

*The yeast dosage can vary depending on the initial Brix, manufacturer’s recommendations and the sanitary state of the grapes or winery. Visit scottlab.com for a video animation of this protocol.

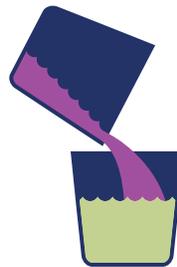
Step 1
Add GO-FERM or GO-FERM PROTECT Evolution to warm water.



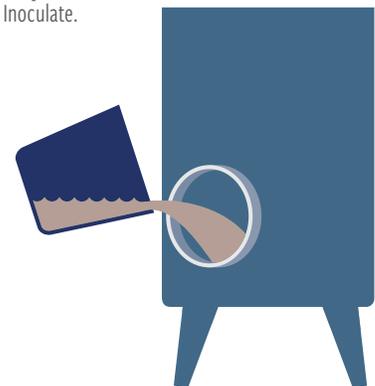
Step 2
Cool, add yeast, stir, let stand for 20 minutes, stir.



Step 3
Attemperate.
Repeat if necessary.



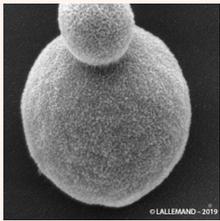
Step 4
Inoculate.



The term non-*Saccharomyces* (or non-Sacc) is a colloquial term that is used to refer to the yeast associated with the pre- and early fermentation stages of winemaking that are not of the genus *Saccharomyces*. These yeast encompass approximately 20 genera and over 700 species. This diverse group of yeast has long been recognized for their contributions to wine aroma, flavor and mouthfeel; however, their behavior is largely unpredictable. Thus, active dried strains of non-*Saccharomyces* yeasts have been developed to harness their positive attributes.

Today, the non-Sacc yeasts available include strains of *Torulaspora delbrueckii*, *Metschnikowia pulcherrima*, *Metschnikowia fructicola* and *Lachancea thermotolerans*. Non-Sacc yeasts often work in different ways than traditional *Saccharomyces* strains. These organisms are either non-fermentative or mildly fermentative and do not have the ability to complete alcoholic fermentation.

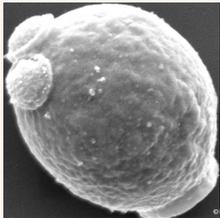
Non-Sacc yeasts can enhance aromas and mouthfeel and modulate acid composition allowing you to drive a specific wine style. Non-Sacc yeasts can also act as antimicrobial and antioxidant agents. Their actions are different from traditional winemaking tools like SO₂, however during the pre-fermentative stages these yeasts can be more effective than SO₂.



Metschnikowia pulcherrima

***Metschnikowia* species can protect from microbial spoilage (bioprotectant)**

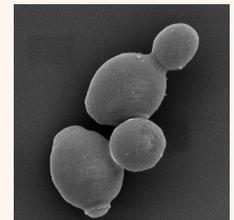
Adaptation is the key to survival. Organisms with successful adaptation strategies are more likely to survive than others. LEVEL² INITIA™ and GAIA are different species of *Metschnikowia* that can inhibit indigenous microflora. This allows them to survive in the challenging juice/must environment. However, their adaptation and survival mechanisms differ. Indigenous yeast require oxygen. INITIA, is a specific strain of *Metschnikowia pulcherrima* that very quickly scavenges oxygen leaving the juice depleted. INITIA in part survives due to its ability to outcompete indigenous microflora for oxygen. GAIA, a specific strain of *Metschnikowia fructicola* suppresses indigenous organisms via a phenomenon called microbial crowding. By using INITIA in white or rosé juice, or GAIA in red must, these bioprotectants suppress volatile acidity-causing yeast and bacteria.



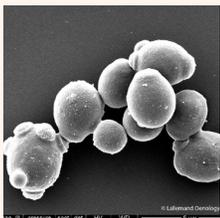
M. pulcherrima

***M. pulcherrima* and *Torulaspora delbrueckii* enhances volume and aromatic complexity**

LEVEL² FLAVIA™ and LEVEL² BIODIVA™ are strains of *Metschnikowia pulcherrima* and *Torulaspora delbrueckii*, respectively. These organisms have interesting enzymatic abilities that *S. cerevisiae* does not. Inoculated into the fermentation vessel, FLAVIA can release bound varietal compounds like thiols and terpenes whereas BIODIVA produces esters. This means that wines are more complex with enhanced tropical, citrus, fruity and spicy aromas. These specific strains of non-Sacc can also impact mouthfeel due to release of mannoproteins (FLAVIA) or polyols like arabinol (BIODIVA). BIODIVA and other *Torulaspora delbrueckii* strains can initiate fermentation, therefore, they should not be used as a bioprotectant.



Torulaspora delbrueckii



Lachancea thermotolerans

***Lachancea thermotolerans* can modulate acid composition**

LEVEL² LAKTIA™ is a strain of *Lachancea thermotolerans* that can produce lactic acid and other minor metabolites from glucose. This production of lactic acid can have an impact on pH and titratable acidity. Depending on the level of lactic acid produced (2->9g/L) LAKTIA can be used to enhance complexity or give an interesting blending component for wines lacking freshness.

All photos © Lallemand Oenology 2019

HOW TO USE NON-SACCHAROMYCES YEASTS

Non-Sacc yeasts need to be handled a little differently from *Saccharomyces* yeast (see usage on pg. 35-37). Non-Sacc yeast have a very low tolerance to ethanol and CO₂, therefore they are most active until the alcohol level reaches approximately 5% v/v. To ensure a complete alcoholic fermentation a *Saccharomyces* strain should be added, and the YAN adjusted accordingly (see pg. 45). Always be sure to consult strain-specific instructions when using a non-*Saccharomyces* yeast as the timing of your secondary *Saccharomyces* inoculation will depend on the Non-*Saccharomyces* strain you have selected.

While they require a bit of extra care, the non-*Saccharomyces* yeasts in our portfolio are powerful tools to enhance wine quality and allow the winemaker to achieve their desired wine style.

ARTICLE TROUBLESHOOTING GUIDE FOR SLUGGISH 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 might 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 course of action.

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).

The protocol in our handbook (pg 41) can walk you through the necessary steps to restart a sluggish or stuck fermentation.

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 long as there are no 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 Inter-Rhône 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 or FERMIVIN® CHAMPION is preferred for the restart, then the multi-step build-up protocol “Traditional Method to Restart a Stuck Fermentation” can be used (see scottlab.com).

THE JUICE/WINE MIGHT 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 53), in addition to stirring. A side benefit of GO-FERM™ and GO-FERM PROTECT EVOLUTION™ (pgs 46-47) 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 38) contains proper timing and steps for acclimatization.

THERE MAY NOT BE ENOUGH YEAST

If you didn’t inoculate at the appropriate rate it is possible that you don’t have a sufficient population of yeast. In this case a re-inoculation might be necessary.

THE YEAST POPULATION IS NOT HEALTHY

You may have an adequate population, but the cells may not be healthy.

THE YEAST MIGHT NEED ADDITIONAL NUTRIENTS

For a fermentation to be happy and healthy it is essential that the yeast have enough nutrients. Even when starting with high nutrient levels (>300ppm YAN) additional nutrients are almost always needed at 1/3 of the way through the fermentation. If you’re at the tail end of the fermentation with just a small amount of sugar left, an addition of RESKUE™ (pg 53) and a mixing can be beneficial.

THE TEMPERATURE OF THE WINE IS PROBLEMATIC

Each yeast strain has an optimal temperature range for fermentation. Anything outside of this range can cause stress for the yeast. If your temperature is too low, try warming the

wine slowly. If the temperature is too high, or if it spiked at any point, it’s possible that the yeast are no longer viable and a re-inoculation will be necessary. To increase success rates at the end of fermentation, try adjusting the temperature of the wine to 20-22°C (68-72°F).

THE ALCOHOL MAY BE TOO HIGH FOR YOUR SELECTED YEAST STRAIN

Certain yeast strains can tolerate more alcohol than others. If you have exceeded the tolerance level of your selected strain, you may need to re-inoculate with a strain that has a higher tolerance. Based on your starting sugar, you should always select a strain that will be able to handle the potential alcohol level.

THE WINE MIGHT NEED A DETOXIFICATION

When wine yeast become stressed, they can produce certain compounds that impede fermentation. RESKUE™ (pg 53) 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.

THERE MIGHT 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 inoculated with ML 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. Unwanted LAB activity can be prevented by Lysovin (pg 108) if malolactic fermentation (MLF) isn’t complete but is desired, or BACTILESS™ (pg 109) 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.

HOW TO**RECOMMENDED METHOD TO RESTART
A STUCK FERMENTATION USING UVAFERM 43 RESTART™****PREPARE THE STUCK WINE**

1. Address any potential spoilage organism concerns with SO₂, BACTILES™ or LYSOVIN additions.
2. Suspend 40 g/hL (3.3 lb/1000 gal) RESKUE™ in 10 times its weight of warm water 30–37°C (86–98°F). Wait 20 minutes then add to stuck wine. Mix thoroughly to incorporate.
3. Allow the RESKUE to settle for 48 hours then rack off the settled lees.
4. Adjust the temperature of the RESKUE-treated wine to 20–25°C (68–77°F).

PREPARE THE “PIED-DE-CUVE” (STARTER)

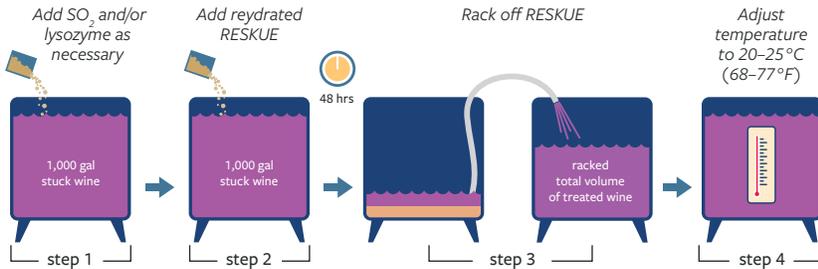
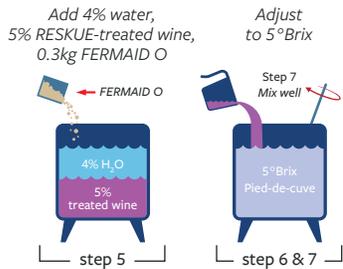
5. Prepare the following:
 - ◆ 5% volume of racked RESKUE-treated stuck wine
 - ◆ 4% of total stuck wine volume of chlorine free water
 - ◆ 8 g/hL (0.66 lb/1000 gal) FERMAID O™
6. Adjust to 5°Brix.
7. Mix well.

YEAST REHYDRATION

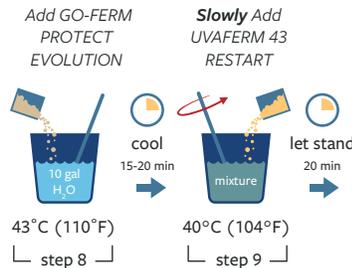
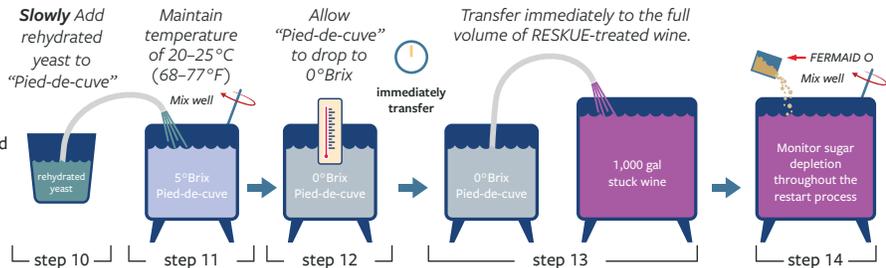
8. Add 53 g/hL (4.4 lbs/1000 gal) of GO-FERM PROTECT EVOLUTION™ in 10 gallons of water at 43°C (110°F).
9. Cool solution to 40°C (104°F) and add 40 g/hL (3.3 lbs/1000 gals) of UVAFERM 43 RESTART™.
10. Wait 20 minutes and slowly acclimate the yeast before adding to the “Pied-de-cuve.”
11. Maintain temperature of 20–25°C (68–77°F).

INCORPORATION OF THE “PIED-DE-CUVE”

12. Allow “Pied-de-cuve” to drop to 0°Brix.
13. Transfer immediately to the full volume of RESKUE-treated wine.
14. Add 40 g/hL (3.3 lbs/1000 gal) of FERMAID O to tank. Mix to homogenize. Monitor sugar depletion throughout the restart process.

Prepare the Stuck Wine**Prepare the “Pied-de-cuve” (starter)**

let stand while *immediately* preparing the nutrient/yeast mixture

Yeast Rehydration**Incorporation of the “Pied-de-cuve”****STAFF PICK**

Our recently introduced RESKUE/43 RESTART protocol has been a game changer for stuck and sluggish ferments. I’ve seen it solve many problems for winemakers—while saving time and people power!—Mollie Forest, Sales Representative, based in Washington State



YEAST NUTRIENTS

Yeast are living organisms. When treated well, they survive most winemaking conditions. Yeast perform the best when their physical and nutritional needs are met. If yeast needs are not met, they become stressed and their performance is diminished. To optimize yeast performance and to encourage a successful fermentation ensure that yeasts' requirements for vitamins, minerals, survival factors and nitrogen are met.

SUPPLEMENTING YEAST 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 juice/must, both assimilable amino acids (proline is not assimilable) and ammonia need to be measured.

Yeast require vitamins and minerals. Interestingly, the higher the YAN the more vitamins and minerals yeast require. Vitamins and minerals are co-factors for growth and aroma metabolism and yeast cannot survive without them.

Yeast survival factors (sterols and unsaturated fatty acids) are essential 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 nitrogen, vitamins, minerals, sterols and unsaturated fatty acids, the cells will be off to a great start and wine quality will be enhanced!

HOW MUCH YAN IS REQUIRED?	YEAST STRAIN NUTRIENT NEEDS	QUALITY OF NITROGEN
<p>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.</p> <p>YAN will vary between vintages, vineyards and varieties so it is necessary to analyze each lot of fruit. Analysis should be conducted as close to yeast inoculation as possible.</p>	<p>Different yeast strains have different nitrogen demands and are classified as low, medium or high nitrogen need according to the following:</p> <ul style="list-style-type: none"> • Low nitrogen-demand: yeast need 7.5 ppm YAN per 1°Brix • Medium nitrogen-demand: yeast need 9 ppm YAN per 1°Brix • High nitrogen-demand: yeast need 12.5 ppm YAN per 1°Brix 	<p>Organic (amino acids) and inorganic nitrogen (ammonia) 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).</p> <p>See more information on nitrogen supplementation and the importance of organic nitrogen at scottlab.com.</p>
INITIAL SUGAR CONTENT	TEMPERATURE	OXYGEN
<p>The higher the initial sugar content, the more YAN required.</p>	<p>An increase in temperature stimulates fermentation rate and yeast growth, thereby requiring increased levels of nitrogen.</p>	<p>When adding oxygen to the juice/must, nitrogen is captured faster, therefore more nitrogen is needed.</p>
TURBIDITY	PRE-FERMENTATION PRACTICES	FRUIT QUALITY
<p>When juice is over-clarified (<50 NTU), many nutritional factors for yeast are removed, making it necessary to supplement with complete and balanced nutrients.</p>	<p>Vitamins and minerals are quickly consumed (even in healthy fruit) by native microflora and other intentionally introduced yeast such as the non-<i>Saccharomyces</i> yeast in our portfolio. This means that prior to <i>Saccharomyces</i> inoculation essential factors may be deficient in musts with significant microbial activity. However, proper supplementation can compensate for these deficiencies.</p>	<p>The presence of molds and rot will impact grape juice/must chemistry. Studies have shown that grapes impacted by <i>Botrytis cinerea</i> and other molds are highly deficient in YAN and other essential nutrients.</p>

CHOOSING YEAST NUTRIENTS & YEAST DERIVATIVE NUTRIENTS

- ◆ Highly Recommended
- ◊ Recommended

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 27 CFR 24.246. The ingredients in Fermaid K and Fermaid K (Kosher) are listed as acceptable in good commercial winemaking practice in either 27 CFR 24.250 or 27 CFR 24.246. For more information please visit www.TTB.gov.

	DAP	FERMAID K + FERMAID K (KOSHER)	FERMAID O	GO-FERM	GO-FERM PROTECT EVOLUTION	RESKUE	STIMULA CABERNET	STIMULA CHARDONNAY	STIMULA SAUVIGNON BLANC	STIMULA SYRAH	GLUTASTAR	NOBLESSE	OPTI-MUM RED	OPTI-RED	OPTI-WHITE
Page#	52	52	53	47	46	53	47	48	48	49	54	55	56	56	56
Measurable YAN/YAN equivalents* (in ppm) at 25 g/hL dose	50/50	25/25	10/40-60	-	-	-	10/40-60	10/40-60	10/40-60	10/40-60	-	-	-	-	-
Measurable YAN/YAN equivalents* (in ppm) at 30 g/hL dose	60/60	30/30	12/48-72	-	-	-	12/48-72	12/48-72	12/48-72	12/48-72	-	-	-	-	-
Measurable YAN/YAN equivalents* (in ppm) at 40 g/hL dose	80/80	40/40	16/64-96	-	-	-	16/64-96	16/64-96	16/64-96	16/64-96	-	-	-	-	-
Yeast rehydration nutrient				◊	◆										
Yeast stimulant for increasing positive thiols (aromatics)					◊				◆	◆					
Yeast stimulant for increasing positive esters (aromatics)			◊				◆	◆							
Does not contain DAP (inorganic nitrogen)			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contains organic nitrogen from autolyzed yeast		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Contains supplemented vitamins and minerals		✓													
Contains naturally occurring vitamins and minerals			✓	✓	✓		✓	✓	✓	✓					
Contains supplemented thiamin		✓													
Inactivated yeast for challenging conditions						◆									
Protects aromatic freshness and color (antioxidant)											◆	◊			◊
Develops mid-palate intensity in whites and rosés											◊	◆			◆
Develops mid-palate intensity in reds												◊	◆	◊	
Facilitates oak integration												◆	◆	◊	◊
Color and tannin stabilization													◆	◊	
Decreases alcohol perception												◊	◆	◊	
Increase overall balance			◊		◊			◊	◊	◊	◊	◆	◆	◊	◊
Reduces bitterness or green character							◆							◊	◊
Reduced production of sulfur off-odors during fermentation		◊	◆	◊	◆		◆	◆	◆	◆		◊			
Reduces sulfur defects										◆		◊		◊	
OMRI Listed			✓	✓	✓							✓	✓	✓	✓
Approved under 27 CFR 24.246	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Approved under 27 CFR 24.250		✓													

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 Oenology has demonstrated that organic forms of YAN are

4-6 times more efficient than inorganic YAN. This means that a 25 g/hL 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.

Yeast require a balance of nutrients to insure the timely completion of alcoholic fermentation. Even if nitrogen is not the only nutrient that yeast require, it is the one that wine-makers respond to and manage the most. Yeast assimilable nitrogen (YAN) is the sum of nitrogen from ammonia, primary amino acids (everything except proline) and specific peptides. YAN drives yeast cell number and fermentation rate. As demonstrated in Figure 1 the higher the starting nitrogen the faster the fermentation rate (shown as a function of CO₂ production). However, irrespective of starting YAN (Figure 2), nitrogen in the form of ammonia is depleted at roughly the same point in the fermentation; however, the time it takes to get to that point may vary. When

initial YAN is high you may think that you do not need to supplement; however, to support the large cell population and for fermentation to continue a small addition of FERMAID O™, FERMAID K™, STIMULA CHARDONNAY™ or STIMULA CABERNET™ is recommended at 1/3 sugar depletion. There is increased evidence that when your starting YAN is >300ppm you will need to support this larger cell population with increased levels of vitamins, minerals and lipids. This can be achieved during the rehydration phase using GO-FERM PROTECT EVOLUTION™. If these essential nutrients are deficient, then the ability of the cells to complete fermentation is jeopardized.

BEST PRACTICES FOR HIGH JUICE/MUST YAN:

- Choose a medium to high YAN requiring yeast strain with a wide temperature range if you have inadequate cooling
- Rehydrate yeast in GO-FERM PROTECT EVOLUTION™ to supply the much-needed vitamins, minerals and lipids
- At 1/3 sugar depletion add 10-30g/hL FERMAID O™ or FERMAID K™ (or 40g/hL STIMULA CHARDONNAY™ for fruity whites and rosés or STIMULA CABERNET™ for reds)
- Ensure that you mix (turning over the tank volume at least once) throughout the fermentation to keep the yeast in suspension
- Try to maintain a fermentation rate of 2-4°Brix drop per day
- If there are signs of yeast stress at the tail end of fermentation (80% complete) such as H₂S production, waxy/soapy aromas, elevated VA or signs of malolactic fermentation, treat appropriately with REDULESS™, RESKUE™, BACTI-LESS™ or Lysozyme
- If ML is desired, choose an appropriate ML strain and nourish the bacteria with either OPTI™ ML BLANC™ or ML RED BOOST™

Figure 1

CO₂ Production as a Function of Ammonia Concentration

Bely M., et al. (1990)

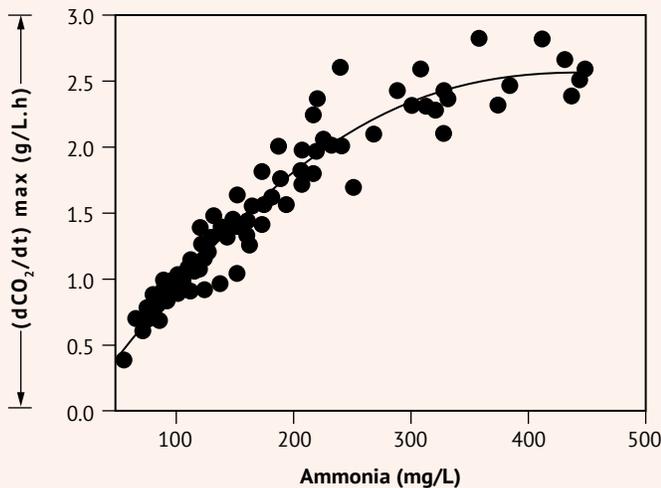
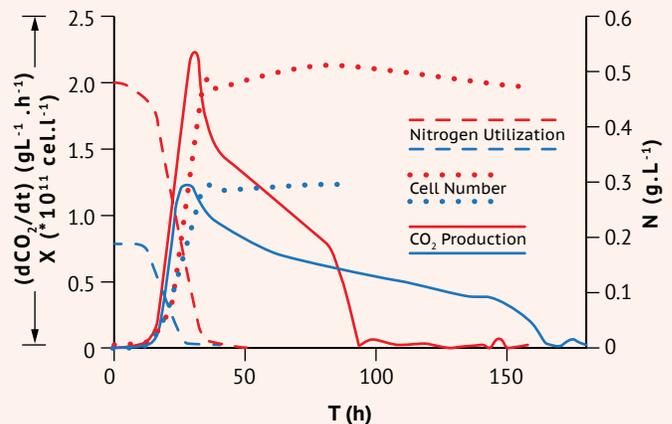


Figure 2

Yeast Cell Growth, CO₂ Production and Nitrogen (Ammonia) Utilization Over Time

Sablayrolles J-M., et al. (2015)



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 GO-FERM PROTECT EVOLUTION™, whereas nitrogen is supplied by FERMAID O™ or FERMAID K™.

Yeast also use essential nutrients to stimulate certain metabolic pathways resulting in increased wine aroma. The STIMULA™ range of nutrients both nourishes the cells and stimulates metabolic pathways to increase aromas and flavors.

Use the following step-by-step guide to develop a complete yeast nutrition program for each fermentation goal. This planner accounts for the individual needs of the yeast, how much fermentable sugar is present, and how much nitrogen is required by the yeast for the desired wine goal.

1. Choose the yeast strain. Strains can be found on pgs 12-17 and are classed as low, medium or high nitrogen-need.
2. Measure sugar (Brix) and YAN in juice/must.
3. Determine the yeast strain's Measurable YAN requirement using Table 1.
4. Calculate the amount of Measurable YAN that needs to be supplemented:

$$[\text{Yeast Measurable YAN Requirement (using Table 1)}] - [\text{Measurable YAN of Juice or Must}] = \text{Amount of YAN Required to Supplement (ppm)}$$
5. Determine fermentation goal and follow program as outlined below:

Table 1: Yeast Assimilable Nitrogen (YAN) * needs of yeast at different starting sugars

Sugar °Brix	Yeast Strain Measurable YAN* Requirements (ppm N)		
	Low N need strain	Medium N need strain	High N need strain
20	150	180	250
22	165	200	275
24	180	220	300
26	195	240	325
28	210	260	350
30	225	280	375

* based on supplementation with inorganic nitrogen source, see pg 43 for info on YAN Equivalents

GOAL — FERMENTATION SECURITY

YAN Required to Supplement	At Yeast Rehydration Phase	At 2-3 °Brix Sugar Drop	At 1/3 Sugar Drop
0-50 ppm	30 g/hL (2.5 lb/1000 gal) GO-FERM PROTECT EVOLUTION	No addition	30 g/hL (2.5 lb/1000 gal) FERMAID O
51-100 ppm		20 g/hL (1.7 lb/1000 gal) FERMAID O	20 g/hL (1.7 lb/1000 gal) FERMAID O + 12.5 g/hL (1.0 lb/1000 gal) FERMAID K
101-150* ppm		40 g/hL (3.3 lb/1000 gal) FERMAID O	40 g/hL (3.3 lb/1000 gal) FERMAID K

GOAL — FERMENTATION SECURITY AND REVELATION OF THIOLS IN REDS, WHITES AND ROSÉS

YAN Required to Supplement	At Yeast Rehydration Phase	At 2-3 °Brix Sugar Drop	At 1/3 Sugar Drop
0-50 ppm	30 g/hL (2.5 lb/1000 gal) GO-FERM PROTECT EVOLUTION	40 g/hL (3.3 lb/1000 gal) STIMULA SAUVIGNON BLANC or STIMULA SYRAH	10 g/hL (0.8 lb/1000 gal) FERMAID O
51-100 ppm			20 g/hL (1.7 lb/1000 gal) FERMAID O
101-150* ppm			40 g/hL (3.3 lb/1000 gal) FERMAID O

GOAL — FERMENTATION SECURITY AND PRODUCTION OF ESTERS IN REDS, WHITES AND ROSÉS

YAN Required to Supplement	At Yeast Rehydration Phase	At 2-3 °Brix Sugar Drop	At 1/3 Sugar Drop
0-50 ppm	30 g/hL (2.5 lb/1000 gal) GO-FERM PROTECT EVOLUTION	No addition	40 g/hL (3.3 lb/1000 gal) STIMULA CHARDONNAY or STIMULA CABERNET
51-100 ppm		20 g/hL (1.7 lb/1000 gal) FERMAID O	
101-150* ppm		40 g/hL (3.3 lb/1000 gal) FERMAID O	

*If your calculation requires >150ppm nitrogen it is suggested to choose a yeast strain with a lower nitrogen requirement.

Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
Cleaning
Fruit Wines & Mead
General Tools
Index

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Fruit Wines & Mead
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Index

REHYDRATION NUTRIENTS FOR CELL PROTECTION

Rehydration is the first stage of a multi-step yeast nutrient strategy. Yeast rehydration nutrients provide natural micronutrients (vitamins and minerals) and survival factors (sterols and unsaturated fatty acids) to the yeast at a time when 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.

Never use nutrients containing DAP during yeast rehydration—they are toxic to the yeast.

OMRI **GO-FERM PROTECT EVOLUTION** **LALLEMAND**
 Yeast rehydration nutrient; OMRI listed

#15103	2.5 kg	\$85.70
#15251	10 kg	\$290.20

GO-FERM PROTECT EVOLUTION™ is the latest generation of yeast rehydration nutrients to support healthy fermentations while increasing aroma uptake and production. This formulation has optimized the bioavailability of vitamins, minerals and sterols, all of which are derived from autolyzed wine yeast. The benefits are clearly seen at the end of alcoholic fermentation (Figure 1).

Yeast rehydrated in GO-FERM PROTECT EVOLUTION have enhanced viability (Figure 2), vitality and tolerance to wine stresses such as ethanol, acid, sugar and temperature. The yeast also express more aromatic varietal aromas (Figure 3) due to GO-FERM PROTECT EVOLUTION's high ergosterol content which enables yeast membrane transport systems to better assimilate aromatic precursors.

When used in fermentations where oxygen additions are difficult, GO-FERM PROTECT EVOLUTION's enhanced sterol content can replace the recommended second oxygen addition at 1/3 sugar depletion.

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. Acclimatize yeast as necessary (see pg 38 for more details).

Note: 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 and is to be expected.

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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Note: This recommendation is based on a yeast inoculum of 2 lb/1000 gal- lons (25 g/hL). If using more or less yeast, use a ratio of 1 part yeast to 1.25 parts GO-FERM PROTECT EVOLUTION.

Stage of Winemaking: During yeast rehydration	Provides: Natural vitamins, minerals, and survival factors in autolyzed yeast base
Impact: Supports healthy fermentation, minimizes yeast stress, optimizes aromas	YAN contribution: Insignificant

Figure 1: Impact of GO-FERM PROTECT EVOLUTION on Fermentation Kinetics in a High Nitrogen, Low Sugar Ferment.

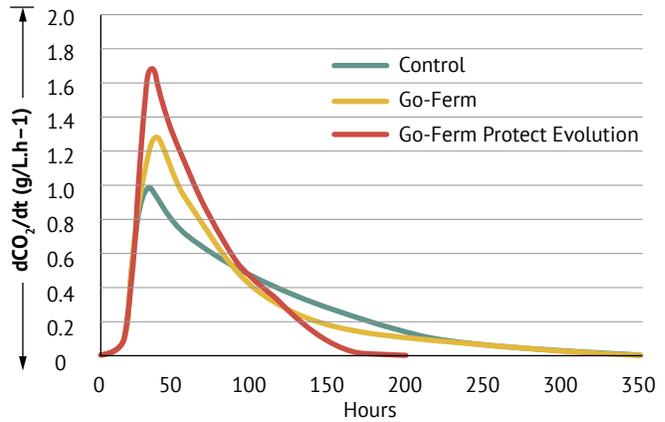


Figure 2: Impact of GO-FERM PROTECT EVOLUTION on Yeast Viability 115 Hours Post-Inoculation

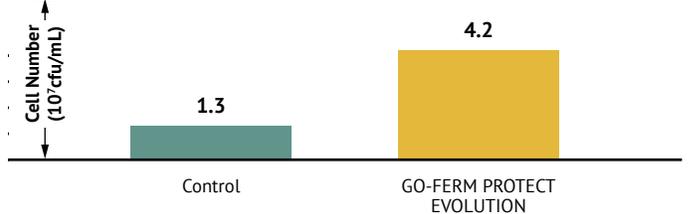
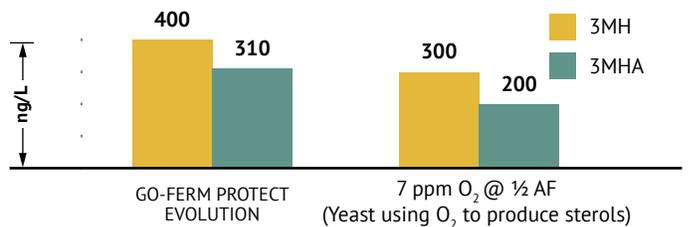


Figure 3: Impact of GO-FERM PROTECT EVOLUTION vs Oxygen on Varietal Thiol Production



GO-FERM

Yeast rehydration nutrient; OMRI listed

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.

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

#15149	1 kg	\$38.30
#15135	2.5 kg	\$71.60
#15161	10 kg	\$232.80

10°C(18°F) difference. Acclimatize yeast as necessary (see pg 38 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.

Recommended Dosage	30g/hL	2.5 lb/1000 gal
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Note: This recommendation is based on a yeast inoculum of 2 lb/1000 gallons (25 g/hL). If using more or less yeast, use a ratio of 1 part yeast to 1.25 parts of GO-FERM.

Stage of Winemaking: During yeast rehydration	Provides: Natural vitamins & minerals in autolyzed yeast base	Impact: Supports healthy fermentations	YAN contribution: Insignificant
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YEAST STIMULANTS FOR OPTIMIZING AROMAS

The STIMULA™ range of yeast nutrients are some of the most innovative products within the Lallemand Oenology portfolio. Yeast nutrients are generally used to nourish cells and assist them with the challenges of fermentation. 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 metabolism. When used at specific times during fermentation, ester production, thiol uptake, revelation and release, are increased. The STIMULA natural yeast autolysates can be used in any varietal where you wish to optimize varietal expression or fruity and floral ester production.

NEW

STIMULA CABERNET

Stimulates fruity aroma compounds in red wines

STIMULA CABERNET™ is a yeast nutrient optimized to stimulate the yeast's production of fruity esters in red wines. When STIMULA CABERNET is added at ½ sugar depletion it triggers specific yeast metabolic pathways resulting in red and black fruit aromas (see Figure). Wines made with STIMULA CABERNET are also noted for their increased complexity and diminished vegetal/herbaceous notes. This 100% autolyzed yeast-based nutrient is rich in specific amino acids, small peptides, vitamins and minerals.

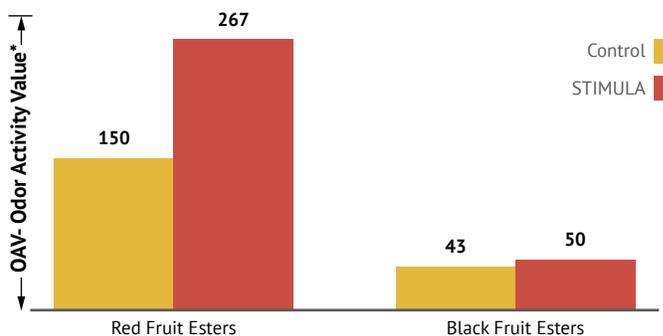
Usage: Mix STIMULA CABERNET in 10 times its weight of clean, chlorine-free water or must and add to the fermentation at ½ sugar depletion. It is essential that the timing of addition is respected. STIMULA CABERNET is not fully soluble. Stir to maintain suspension before and during addition.

Storage: Dated expiration. Store in a dry environment at 18°C (65°F). Once opened, use immediately.

#15268	1kg	\$44.40
Recommended Dosage	40g/hL	3.3 lb/1000 gal

Impact of STIMULA CABERNET™ on red and black fruits aromas on a 2019 Cabernet Sauvignon from Bordeaux, France

Must analysis: 238g/L sugar, 218ppm YAN, pH3.46



*An OAV value is the sum of the aroma compounds compared to their sensory threshold. A positive number means aromas are above sensory threshold.

Stage of winemaking: During fermentation at ½ sugar depletion	Provides: Organic nitrogen with vitamins (biotin) and minerals (magnesium and zinc)	Impact: Stimulates red and black fruity esters and minimizes herbaceous notes	Measurable YAN at 40g/hL dose: 16ppm YAN equivalents at 40g/hL dose: 64-96ppm
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Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
Cleaning
Fruit Wines & Mead
General Tools
Index

STIMULA CHARDONNAY LALLEMAND

Stimulates fruity and floral aroma compounds in white and rosé wines

STIMULA CHARDONNAY™ is used to optimize the yeast's production of fruity and floral flavors in white and rosé wines. When STIMULA CHARDONNAY is added at 1/3 sugar depletion it triggers specific yeast metabolic pathways resulting in increased ester production (see Figure). Wines made with STIMULA CHARDONNAY are also noted for their increased complexity and smooth mouthfeel. This 100% autolyzed yeast-based nutrient is rich in specific amino acids, small peptides, sterols, vitamins and minerals allowing for optimized wine aromatic potential.

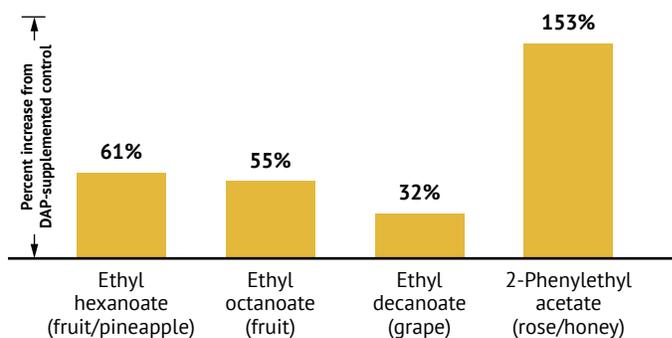
Usage: Mix STIMULA CHARDONNAY in 10 times its weight of clean, chlorine-free water or juice and add to the fermentation at 1/3 sugar depletion. It is essential that the timing of addition is respected. STIMULA CHARDONNAY is not fully soluble. Stir to maintain suspension before and during addition.

Storage: Dated expiration. Store in a dry environment at 18°C (65°F). Once opened, use immediately.

Stage of winemaking: During fermentation at 1/3 sugar depletion	Provides: Organic nitrogen with natural vitamins and minerals	Impact: Increases fruity and floral aromas	Measurable YAN at 40 g/hL dose: 16 ppm YAN equivalents at 40 g/hL dose: 64-96 ppm
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#15245	1 kg	\$44.40
#15260	10 kg	\$385.90
Recommended Dosage	40g/hL	3.3 lb/1000 gal

Impact of STIMULA CHARDONNAY™ on Ester Production in Languedoc Chardonnay



STIMULA SAUVIGNON BLANC LALLEMAND

Stimulates tropical and citrus aroma compounds in whites and rosé wines

STIMULA SAUVIGNON BLANC™ is used to optimize the yeast's ability to reveal and enhance varietal compounds originating in certain grapes maximizing fruity, floral and spicy aromas. Adding STIMULA SAUVIGNON BLANC at the beginning of active fermentation stimulates yeast to liberate varietal thiols (see Figure) and terpenes. This results in elevated tropical fruits, citrus and box wood/gooseberry. When used to produce rosé wines, blackcurrant aromas can also be present. Due to the unique formulation, wines made using STIMULA SAUVIGNON BLANC have a fuller mouthfeel and less sulfur off-odors. This 100% autolyzed yeast-based nutrient rich in specific amino acids, small peptides, vitamins and minerals helps to optimize the aromas and flavors associated with many aromatic white cultivars including Sauvignon blanc, Riesling, Pinot gris, Chardonnay and Semillon.

Usage: Mix STIMULA SAUVIGNON BLANC in 10 times its weight of clean, chlorine-free water or juice and add to the fermentation at 2-3°Brix drop. It is essential that the timing of addition is respected. STIMULA SAUVIGNON BLANC is not fully soluble. Stir to maintain suspension before and during addition.

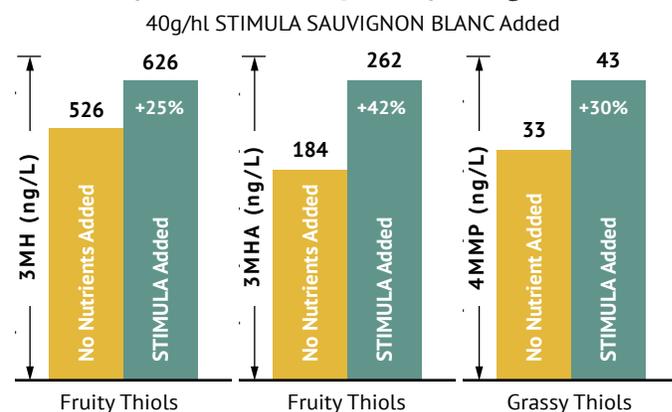
Stage of winemaking: During fermentation at 2-3°Brix sugar drop	Provides: Organic nitrogen with natural vitamins and minerals	Impact: Optimizes tropical, citrus and boxwood aromas	Measurable YAN at 40 g/hL dose: 16 ppm YAN equivalents at 40 g/hL dose: 64-96 ppm
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#15246	1 kg	\$44.40
#15255	10 kg	\$385.90
Recommended Dosage	40g/hL	3.3 lb/1000 gal

Storage: Dated expiration. Store in a dry environment at 18°C (65°F). Once opened, use immediately.

Recommended Dosage	40g/hL	3.3 lb/1000 gal
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Impact of STIMULA SAUVIGNON BLANC™ on Fruity & Grassy Thiols in 2018 Napa Valley Sauvignon blanc



NEW

STIMULA SYRAH LALLEMAND

Stimulates floral and spicy compounds in red wines

STIMULA SYRAH™ optimizes the yeast’s ability to reveal and enhance varietal compounds originating in certain red grapes maximizing fruity, floral and spicy aromas. Adding STIMULA SYRAH at the beginning of active fermentation stimulates yeast to liberate varietal thiols, terpenes and nor-isoprenoids. Due to its unique formulation, wines made using STIMULA SYRAH have more complexity and less sulfur off-flavors like hydrogen sulfide.

Usage: Mix STIMULA SYRAH in 10 times its weight of clean, chlorine-free water or must and add to the fermentation at 2-3°Brix drop. It is essential that the timing of addition is respected. STIMULA SYRAH is not fully soluble. Stir to maintain suspension before and during addition.

Storage: Dated expiration. Store in a dry environment at 18°C (65°F). Once opened, use immediately.

#15269

1kg

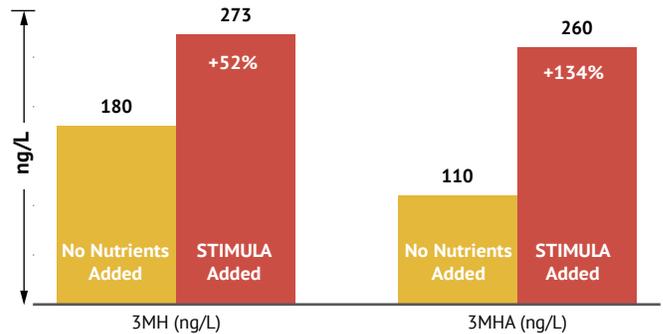
\$44.40

Recommended Dosage	40g/hL	3.3 lb/1000 gal
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Impact of STIMULA SYRAH™ on volatile thiol (blackcurrant) release and conversion on a 2018 South African Syrah

Must analysis: 256g/L sugar, 156ppm YAN, pH3.54

40g/hL STIMULA SYRAH Added



Stage of winemaking: During fermentation at 2-3°Brix drop	Provides: Organic nitrogen with vitamins (calcium pantothenate and thiamin) and minerals (magnesium)	Impact: Optimizes the uptake and release of varietal precursors, and minimizes hydrogen sulfide in sulfide prone varieties	Measurable YAN at 40g/hL dose: 16ppm YAN equivalents at 40g/hL dose: 64-96ppm
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ARTICLE

WHICH STIMULA NUTRIENT SHOULD YOU USE?

Despite their names, STIMULA™ nutrients can be used in almost any variety to help achieve a desired wine style. Which STIMULA to use depends on whether fruity esters or tropical, floral or spicy aromas are desired.

STIMULA CHARDONNAY AND STIMULA CABERNET FOR FRUITY ESTERS

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.

Fermentation esters can be split into two major groups: acetate esters (responsible for rose/floral aromas) and ethyl esters, responsible for red berry/fruit aromas. Although yeast vary in their ability to produce esters (see charts pgs 12-17), ester production is highly influenced by nutrient composition and fermentation conditions. Lipids, vitamins and specific amino acids all support ester production which is why STIMULA CHARDONNAY™ is recommended for all fruity and floral white and rosé wines and STIMULA CABERNET™ is beneficial for all red wines where enhanced red and black fruity aromas are desired.

STIMULA SAUVIGNON BLANC AND STIMULA SYRAH FOR ENHANCED VARIETAL CHARACTERISTICS

Thiols and terpenes are aroma molecules that contribute to a wine’s varietal character. Most grapes and the resulting wines differ aromatically. This may be due to the release of varietal aromas or the production of fermentative aromas. Varietal aromas (precursors) are often odorless and flavorless. It is the action of yeast during fermentation that are partly responsible for releasing varietal aroma compounds. Once released these compounds are described as tropical, citrus, grassy, floral, fruity and/or spicy.

More specifically, most *Saccharomyces* yeast can take up aroma pre-cursors, however only certain yeast strains with specialized enzymatic ability (β -lyase, β -glucosidase) can release the odor-active compound. STIMULA SAUVIGNON BLANC and STIMULA SYRAH provides yeast with the key micronutrients at the right time for enzyme synthesis.

In white and rosé wines STIMULA SAUVIGNON BLANC™ helps yeast release thiols increasing tropical notes of passion fruit, guava and grapefruit. In certain grapes grassy, boxwood and citrus aromas can be revealed. In red wines STIMULA SYRAH™ increases blackcurrant, floral and spicy aromas from bound thiols and terpenes. STIMULA SAUVIGNON BLANC can be used in any varietal from Sauvignon blanc to Pinot gris and Chardonnay whereas or STIMULA SYRAH can be used in most red cultivars including Pinot noir, Grenache, Merlot or Syrah. The possibilities are endless!

PROTOCOL

WINE STYLE GUIDE: MEDIUM-BODIED REDS FERMENTATION PROTOCOL

In general, medium-bodied red wines are described as being fruit-forward (berry, pomegranate and red stone fruits like cherry and plum), spicy and savory (anise, pepper or grilled meat, even tobacco, cedar and leather) or floral with aromas resembling violets and roses. The expression of these aromas and flavors are highly dependent upon the varietal and its handling in the vineyard and winery. In addition to focusing on flavors and aromas, wines can also be concentrated on mouthfeel, either round and smooth or tannin forward and highly structured. There are many factors that can affect final wine taste and quality and although the grape varietal is one of the most influential factors, along with berry size, skin structure, color and thickness, winemakers can drive wine style based on key processing decisions and correct product choice. This guide takes you through yeast, bacteria and nutrients to drive wine style. To review the best practices guide in its entirety, see scottlab.com.

WINEMAKING STAGE	BEST PRACTICE	WINE STYLES				
		FRUIT FORWARD	SPICY/SAVORY	FLORAL	ROUND MOUTHFEEL	TANNIN FORWARD
GRAPE RECEPTION AND PRE-FERMENTATION PROCESSES	Add Non-Saccharomyces Yeast	Recommended NON-SACCHAROMYCES yeast at 25 g/hL depending on wine style: LEVEL 2 BIODIVA™ for fruit forward and round wines due to ester and arabinol (polyol) production LEVEL 2 FLAVIA™ for fruit forward and spicy wines due to the release of bound varietal aromas GAIA™ acts as a bioprotectant inhibiting VA producing native yeast and bacteria during cold-soak LEVEL 2 LAKTIA™ for enhanced wine freshness due to lactic acid production				
	Add Rehydration Nutrient	Recommended REHYDRATION NUTRIENT GO-FERM PROTECT EVOLUTION™ at 30g/hL when using standard yeast dose of 25g/hL				
ALCOHOLIC FERMENTATION	Add Fermentation Yeast	CSM™ EXOTICS NOVELLO ICV GRE™ ICV OKAY™ PERSY™ T73™ TANGO MALBEC™	AMH™ MT48™ RHÔNE 2226™ RP15™	ALCHEMY III ICV D21™ SYRAH™	BDX™ BM 4X4™ CVRP™ ICV D254™	ICV D80™ MT™ NT116
	Fermentation Temperature	60-78°F	68-82°F	61-82°F	64-82°F	59-82°F
	Add Yeast Derivative	Recommended YEAST at 25 g/hL depending on wine style: Recommended YEAST DERIVATIVE depending on wine style:				
		NOBLESSE™ at 30 g/hL	NOBLESSE™ at 30 g/hL or OPTI-RED™ at 30 g/hL	NOBLESSE™ at 30 g/hL	OPTIMUM RED™ at 20-40 g/hL	NOBLESSE™ at 30 g/hL or OPTI-RED™ at 30 g/hL
		Recommended FERMENTATION NUTRIENT* depending on wine style:				
	Add Fermentation Nutrients At 2-3 °Brix Drop	FERMAID O™ at 0-40 g/hL	STIMULA SYRAH™ at 40 g/hL	STIMULA SYRAH™ at 40 g/hL	FERMAID O™ at 0-40 g/hL	FERMAID O™ at 0-40 g/hL
	Add Fermentation Nutrients At 1/3 °Brix Drop	STIMULA CABERNET™ at 40 g/hL	FERMAID O™ at 10-40 g/hL	FERMAID O™ at 10-40 g/hL	FERMAID O™ at 10-40 g/hL	FERMAID K™ at 10-40 g/hL
PRESSING AND RACKING	24-48 Hours Post Fermentation Rack Off Gross Lees	This removes protein, pectin, tartrates, dead and vegetative cells that may negatively impact aromas and mouthfeel				
MALOLACTIC FERMENTATION	Add Malolactic Bacteria Strain	O-MEGA™ MBR 31™ MALOTABS™	PN4™ SOLO SELECT	BETA™	ALPHA™ SILKA™	ELIOS 1™
	Add Malolactic Nutrient	Recommended Malolactic Nutrient-ML RED BOOST™ at 20g/hL				

*Depending on the initial YAN, starting sugar and yeast strain choice you may have to adapt these suggestions. See pg 45 for nutrient supplementation planner based on initial YAN, needed YAN, initial sugar and yeast strain needs.

ARTICLE FERMAID O IS MORE EFFICIENT THAN AMMONIA (DAP)

THE IMPORTANCE OF AN ORGANIC SOURCE OF NITROGEN

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 pg 43). However, nitrogen supplied as DAP is taken up 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 Oenology 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 musts 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.

Figure 1: Fermentation kinetics representing the fermentation activity of yeast according to the three protocols (expressed in g/L.h⁻¹ of CO₂ released).

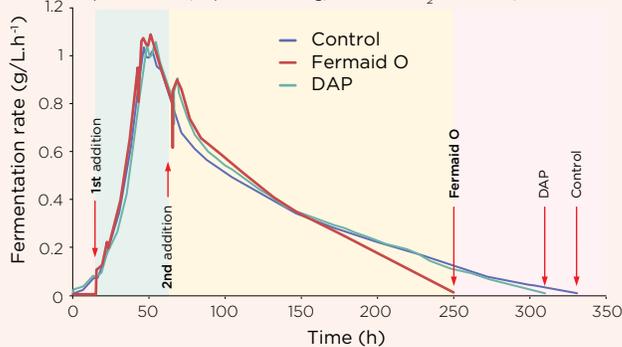
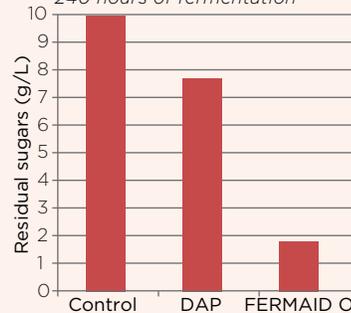


Figure 2: Residual sugars at 240 hours of fermentation



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

#15805	5 kg	\$40.30
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Diammonium phosphate (DAP) should only be used to supplement severely deficient juices/musts. DAP provides inorganic nitrogen and should only be used if necessary and always in combination with complex nutrients.

Usage: Suspend DAP in water or juice/must and mix well before adding, especially during fermentation to avoid CO₂ release and overflowing of vessel.

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: 1/3 sugar depletion if YAN needs cannot be achieved using FERMAID O or FERMAID K	Provides: Ammonia and phosphate	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
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FERMAID K*

Complex yeast nutrient

#15073	2.5 kg	\$63.50
#15070	10 kg	\$163.30

FERMAID K (Kosher) - certified Kosher for Passover

#15070K	10 kg	\$275.10
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FERMAID K™ is a complex yeast nutrient to assist with fermentation security, especially in low YAN situations. This reliable nutrient provides many essential key elements required by the yeast for growth and reproduction and is best used at 1/3 sugar depletion.

Usage: Suspend FERMAID K in water or juice/must and mix well before adding, especially during fermentation to avoid CO₂ release and overflowing of vessel.

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

For optimal fermentation results, FERMAID K should be used in conjunction with the rehydration nutrient, GO-FERM PROTECT EVOLUTION™ (pg 46).

Recommended Dosage	25-50 g/hL	2-4 lb/1000 gal
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*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 24.250 together with 27 CFR 24.246. The ingredients in all other products shown on pgs 46-56 are listed by the TTB as acceptable in good commercial winemaking practice in 27 CFR 24.246. For more information, please visit TTB.gov. This product contains thiamin. The TTB Maximum Legal Dose for thiamin hydrochloride = 0.60 mg/L (0.005 lb/1000 gal) of wine or juice. 21 CFR 184.1875.

Stage of winemaking: 1/3 sugar depletion	Provides: Complex nutrient blend	Impact: Fermentation health and security	Measurable YAN at 25 g/hL dose: 25 ppm YAN equivalents at 25 g/hL dose: 25 ppm
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FERMAID O 
Organic yeast nutrient; OMRI listed

FERMAID O™ is a blend of highly specific inactivated yeast fractions that are rich in assimilable amino acids (organic nitrogen). Its 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, improves fermentation kinetics and the yeast produce lower levels of negative sulfur compounds. FERMAID O use has been correlated with positive aromatic expression (thiols and esters) and mouthfeel. For more info, see article on pg 51.

FERMAID O does not contain any DAP or supplemented micronutrients. For optimal results, FERMAID O should be used

#15067	2.5 kg	\$92.70
#15107	10 kg	\$348.60

in conjunction with GO-FERM PROTECT EVOLUTION™ rehydration nutrient (pg 46).

Usage: Suspend FERMAID O in water or juice/must and mix well before adding, especially during fermentation to avoid CO₂ release and overflowing of vessel.

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

Recommended Dosage	10-40 g/hL	0.83-3.3 lb/1000 gal
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Note: Due to high nutrient requirements, some yeast strains may benefit from additional nutrient supplementation (see yeast reference chart on pgs 12-17 and Nitrogen Supplementation article on pgs 44-45).

Stage of winemaking: Onset of fermentation and/or ½ sugar depletion	Provides: Highly consistent source of amino acids	Impact: Fermentation security and enhanced aroma production	Measurable YAN at 40 g/hL dose: 16 ppm YAN equivalents at 40 g/hL dose: 64-96 ppm
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RESKUE 
Specific inactivated yeast for treating sluggish and stuck fermentations

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 bacteria and are created by yeast during stressful fermentation conditions. Their presence interferes with yeast membrane sugar transport proteins thereby interfering with sugar uptake rates and fermentation success. Using RESKUE removes these toxins and reinvigorates sluggish or stuck alcoholic and/or malolactic fermentations.

Usage: Suspend RESKUE in 10 times its weight of clean 30–37°C (86–98°F) water and mix. Wait 20 minutes then add

#15224	1 kg	\$42.40
#15242	10 kg	\$314.40

to challenging fermentation. For stuck fermentations, allow RESKUE to settle for 48 hours then rack off and follow restart protocol (pgs 41 and 69).

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

Recommended Dosage	30-40 g/hL	2.5-3.3 lb/1000 gal
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RESKUE has unique lumps and bumps! This increased surface area allows for greater adsorption of toxins.

SEM photo provided by Lallemand. Research collaboration with Professor Aude Vernhet at SupAgro Montpellier.

Stage of winemaking: Any point during fermentation	Provides: Highly specific autolyzed yeast with bioadsorptive properties	Impact: Reinvigorates and detoxifies sluggish/stuck fermentations	YAN contribution: Insignificant
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Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
Cleaning
Fruit Wines & Mead
General Tools
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YEAST DERIVATIVE NUTRIENTS

Yeast derivative nutrients 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.

All yeast derivative nutrients will contribute some nitrogen to a fermentation, but different autolyzed yeast products are used for different reasons. The nitrogen (YAN) contribution is only mentioned if the goal of the product is fermentation security. Used alone, these nutrients they should not be viewed as a substitute for the complete range of fermentation nutrition products listed in the preceding pages.

SELECTING YEAST DERIVATIVE NUTRIENTS FOR SUCCESS

Yeast derivatives have been used for centuries, historically in the form of (autolyzed) yeast 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 release, 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 in red, white and rosé wines without the risks associated with lees aging. Yeast derivative nutrients can be used at various stages of the fermentation process, from grape to fermentation completion.

AROMA STABILITY	COLOR STABILITY	PEPTIDES
Glutathione and other peptides protect aromas due to their antioxidant and quinone-scavenging properties. Polysaccharides can bind with some aroma compounds leading to a stabilizing effect as well as a lengthening of aroma sensations.	High molecular weight polysaccharides can interact positively with polyphenolic compounds. This complex can help stabilize polymeric pigments (color).	Peptides act as antioxidants and quinone-scavengers and give the perception of sweetness.
GLUTATHIONE	MOUTHFEEL	POLYSACCHARIDES
Glutathione is a natural tripeptide found in grapes and yeast in two forms: reduced (GSH) and oxidized (GSSH). In wine-making, 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 harmful effects of oxygen.	Aging on lees releases mannoproteins and polysaccharides that result in reduced astringency and an increase in mouthfeel. When polysaccharides complex with tannins there are fewer reactive sites where the tannin can react with salivary proteins, thus lowering the perception of astringency.	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 and bitterness depending on the molecular weight of the compound, its composition and structure.

GLUTASTAR

LALLEMAND

Protects and stabilizes aroma and color compounds against oxidative damage

Aromatic Whites and Rosés

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 brings protective qualities of both specialized (nucleophilic) peptides and reactive glutathione to wines. The effect of GLUTASTAR is long-lasting and its positive impact on varietal and fermentation-derived aromas (Figure 1) and wine color (Figure 2) contribute to a prolonged wine shelf-life.

#15265	1 kg	\$71.60
#15266	10 kg	\$457.50

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.

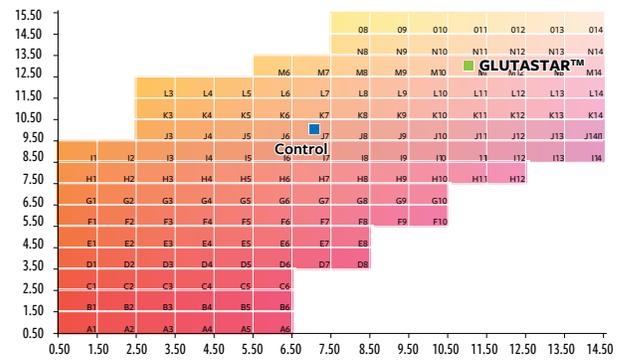
Storage: Dated expiration. Store in a cool and dry environment at 18°C(65°F). Once opened, keep tightly sealed and dry.

Recommended Dosage	30 g/hL	2.5 lb/1000 gal
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Figure 1: Impact of GLUTASTAR on Volatile Thiol Content in a Sauvignon blanc at End of Fermentation



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



Stage of winemaking: Add directly to juice post-pressing	Provides: Peptides, polysaccharides and glutathione	Impact: Scavenges quinones to protect aromas and color	YAN contribution: insignificant
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ARTICLE

GLUTASTAR: MORE THAN GLUTATHIONE

Glutathione protects color and aromas from oxidation. 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 caftaric acid, one of the most browning-susceptible phenols in wine, to generate stable and colorless products. Other wine compounds also contain sulfhydryl groups (some thiols, the amino acid cysteine, and the glutamyl-cysteine dipeptide) but only GSH can react with caftaric acid.

Additionally, GSH can 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 optimize wine quality. 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.**

NOBLESSE

Contributes to balance, sweetness and softness on the finish;
OMRI listed
Reds, Complex Whites and Rosés

NOBLESSE™ 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 NOBLESSE 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.

#15105 | 2.5 kg | \$102.80

Usage: Mix NOBLESSE in 10 times its weight of water or must/juice. Add during a pump-over or tank mixing. 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.

Recommended Dosage	30 g/hL	2.5 lb/1000 gal
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Stage of winemaking: Anytime during fermentation processes	Provides: High and low molecular weight polysaccharides	Impact: Adds sweetness, harmonizes and integrates mouthfeel	YAN contribution: Insignificant
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OPTI-MUM RED

For increased color stability and roundness in red wines; OMRI listed Reds

The yeast strain behind OPTI-MUM RED™ was specifically selected and autolyzed for its highly reactive polysaccharides and oligosaccharides. Upon addition, OPTI-MUM RED's high molecular weight polysaccharides are released and quickly participate in reactions that stabilize color and polyphenolic compounds (tannins). The earlier that OPTI-MUM RED is used the more effective it is in reacting with early diffused color molecules. Using OPTI-MUM RED results in wines that are more intense in color and have a rounder and softer mouthfeel with a decreased perception of astringency.

#15229	1 kg	\$57.50
#15250	10 kg	\$341.60

Usage: Mix OPTI-MUM RED in 10 times its weight of water or juice and add directly to the grapes or must. If adding later in fermentation, add during a pump-over or during tank mixings. This product is mostly soluble. Stir to maintain suspension before and during addition.

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

Recommended Dosage	20–40 g/hL	1.7–3.3 lb/1000 gal
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Stage of winemaking: Add directly to grapes or at first mixing	Provides: High molecular weight polysaccharides and oligosaccharides	Impact: Color stability, volume and softness	YAN contribution: Insignificant
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OPTI-RED

For rounder and smoother tannins in reds; OMRI listed Reds

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.

#15148	1 kg	\$48.40
#15138	2.5 kg	\$102.80
#15211	10 kg	\$297.30

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.

Recommended Dosage	30 g/hL	2.5 lb/1000 gal
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Stage of winemaking: Any time before the completion of fermentation	Provides: High molecular weight polysaccharides	Impact: Early use promotes color stability; late use smooths harsh tannins	YAN contribution: Insignificant
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OPTI-WHITE

Promotes roundness and smoothness and protects aromatics; OMRI listed Complex Whites and Rosés

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

*Use 50 g/hL for maximum antioxidative properties or use GLUTASTAR™ (pg 54) for maximum anti-browning potential.

#15165	1 kg	\$48.40
#15136	2.5 kg	\$102.80
#15216	10 kg	\$297.30

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.

Recommended Dosage	25–50 g/hL	2–4 lb/1000 gal
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Stage of winemaking: Any time before the completion of fermentation	Provides: Polysaccharides and antioxidant peptides	Impact: Balances mouthfeel and protects aromas	YAN contribution: Insignificant
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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 unsaturated fatty acids and sterols for improved sugar uptake capacity and fermentation security.

Why doesn'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, FERMAID K contains DAP and using nutrients that contain DAP during the rehydration phase is toxic to the yeast.

Every harvest I add 2 lb/1000 gal of FERMAID K™ 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 45.

I missed the addition of nutrients at 1/3 sugar depletion. Should I add FERMAID™ nutrients past this point?

The purpose of a nitrogen addition at this point of fermentation is for re-synthesis of the sugar transport system in the yeast cell so that fermentation can continue. Ammonia uptake is inhibited above 10% alcohol; however, new research has shown that amino acids may be used even late in fermentation. A small addition of FERMAID O™ or RESKUE™ may be suitable if the 1/3 sugar depletion addition is missed. Though, 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 amount of 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" at scottlab.com). 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 DAP 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 REDULESS™. 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 wine. Are there any products that can help with this?

Try an addition of OPTI-MUM RED™, OPTI-WHITE™ or NO-BLESSE™.

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.

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MALOLACTIC FERMENTATION

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.

Modern winemakers rely on *Oenococcus oeni*, a specific species

of lactic acid bacteria, to perform MLF. Our specific *O. oeni* strains are compatible with today's winemaking styles. Their use can prevent unwanted microbial growth in high pH wines, wines with low SO₂, and higher alcohol wines. Additionally, these strains can limit biogenic amines and contribute positive flavors and aromas to wines.

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. 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	ALCOHOL LEVEL	pH	SO ₂
Optimal: 20–25°C (68–77°F) Challenging: <60°F or >85°F	Optimal: <13% (v/v) Challenging: >16% (v/v)	Optimal: >3.5 Challenging: <3.5	Optimal: free SO ₂ <10 ppm, total SO ₂ <45 ppm molecular SO ₂ <0.3 ppm Challenging: free SO ₂ >10 ppm, total SO ₂ >60 ppm molecular SO ₂ >0.3 ppm

EFFECT OF pH, SO₂, ALCOHOL, AND TEMPERATURE ON ML GROWTH CONDITIONS

NUTRITIONAL STATUS	VOLATILE ACIDITY (VA)	STRAIN COMPATIBILITY	MALIC AND LACTIC ACID
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 with yeast.	Wines may have elevated VA due to high pH which allows other strains of bacteria to grow. The wine should be monitored for unwanted bacteria.	Choose a yeast strain which is compatible with the selected malolactic bacteria. See MLF Compatibility in the yeast charts on pgs 12-17.	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. This can be stressful for bacteria. Lactic acid levels of 1.5 g/L slow down bacteria and 3 g/L starts to inhibit MLF.

CHOOSING ML BACTERIA AND NUTRIENTS

	Direct Inoculation (MBR) Cultures										Effervescent/Direct Inoculation Cultures	Nutrients			
	BETA CO-INOC	ALPHA	BETA	ELIOS 1	LALVIN MBR 31	O-MEGA	PN4	SILKA	SOLO SELECT	VP41	MALOTABS	ACTI-ML	ML RED BOOST	OPTI'MALO BLANC	OPTI'MALO PLUS
Page#	60	61	62	62	63	63	64	64	65	65	66	66	66	67	67
Alcohol tolerance(% v/v)	<15.0	<15.5%	<15.0	<14.0	<14.0	<16.0	<15.5	<16.0	<16.0	<16.0	<16.0				
pH limit	>3.2	>3.2	>3.2	>3.4	>3.1	>3.1	>3.1	>3.3	>3.2	>3.1	>3.2				
Total SO ₂ limit (mg/L)	<60	<50	<60	<50	<45	<60	<60	<60	<50	<60	<60				
Temperature °C(°F)	>14° (57°)	>14° (57°)	>14° (57°)	>18° (64°)	>13° (55°)	>14° (57°)	>16° (61°)	>15° (59°)	>15° (59°)	>16° (61°)	>16° (61°)				
Relative nutrient demand	High	Low	High	Med	High	Low	Med	Med	Med	Low	Low				
Typical fermentation kinetics	Start	Slow	Fast	Slow	Mod	Slow	Fast	Mod	Mod	Mod	Fast	Fast			
	Finish	Fast	Slow	Fast	Fast	Fast	Fast	Fast	Mod	Mod	Fast	Mod			
Reds	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥	🔥		💧
Whites	🔥	🔥	🔥		🔥	🔥	🔥				🔥	🔥		🔥	💧
Rosés	🔥					🔥					🔥	🔥		🔥	💧
Fruit Wines					🔥	🔥						🔥			🔥
Compatible with Yeast Co-Inoculation	🔥														
Assists with Oak Integration								🔥							
Diacetyl (Buttery) Production		💧	🔥		💧		🔥								
Enhances Freshness						🔥									
Enhances Fruitiness	🔥		🔥		🔥	🔥			🔥	🔥	🔥				
Enhances Mouthfeel and Fullness		🔥			💧		💧	🔥		🔥	🔥				
Enhances Spiciness				🔥			🔥		🔥						
Enhances Structure				🔥			🔥		🔥						
Minimizes Herbaceousness		🔥		🔥			🔥								
Restart Sluggish or Stuck MLF										🔥		🔥			
Bacteria Rehydration Nutrient											🔥				
Nutrient for Red MLF												🔥			
Nutrient for White And Rosé MLF													🔥		
General MLF Nutrient														🔥	
OMRI Listed												🔥	🔥		

*when inoculated in sequential order with yeast

DIRECT ADDITION BACTERIA

Grape juice, grape must and wine environments are hostile to malolactic bacteria (ML) and effective winemaking strains must overcome these hostilities. Lallemmand Oenology developed the MBR™ process to produce robust, **efficient**, and **well-adapted** wine bacteria which can be **directly inoculated without rehydration**. Our MBR™ ML strains rapidly convert malic acid into lactic acid and positively contribute to the wine sensory profile.

Our ML strains do not contain the decarboxylase enzymes known to produce biogenic amines. They are also cinnamyl esterase negative meaning they cannot produce the precursors for ethyl phenol production by *Brettanomyces*.

TIMING OF ADDITION: CO-INOCULATION

Malolactic bacteria can be added just after the yeast so that the alcoholic and malolactic fermentation (MLF) occur simultaneously. This co-fermentation is referred to as co-inoculation. Alternatively, malolactic bacteria can be added towards the end or at the end of alcoholic fermentation. This is referred to as sequential inoculation (see Timing of Inoculation: SEQUENTIAL INOCULATION below).

Co-inoculating bacteria with yeast has many benefits. Malolactic bacteria growth conditions are more favorable during alcoholic fermentation due to warmer temperatures, lack of alcohol, and better nutrient availability. This allows MLF to finish shortly after alcoholic fermentation. Co-inoculation favorably impacts aromas and flavors - wines are fresh and fruity with very little diacetyl (butter) character.

BETA CO-INOC

Co-inoculation strain of *Oenococcus oeni* for fresh and fruit-forward wines

White, Red, Rosé

#15617	25 hL (660 gal) dose	\$108.90
#15618	250 hL (6600 gal) dose	\$560.20

ENOFERM BETA CO-INOC™ is recommended for fresh, fruit-forward red and white wines.

This *Oenococcus oeni* strain was specifically selected by Lallemmand Oenology for reliable malic acid consumption when added to juice/must 24-48 hours after yeast inoculation. BETA CO-INOC is not recommended for use in a sequential MLF.

This strain is a low diacetyl (low buttery aromas) and low VA producer.

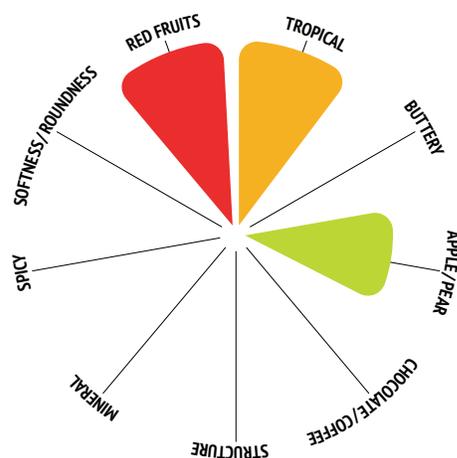
BETA CO-INOC is added directly to pH>3.2 juice/must 24-48 hours after yeast inoculation and before alcohol reaches 5% (v/v). Recommended temperature at inoculation is between 18-25°C (64-77°F) and recommended ongoing temperatures are between 14-28°C (57-82°F). Total SO₂ at crusher should not exceed 60 ppm.

In co-inoculation fermentations, the health and success of the alcoholic fermentation are keys to success. Factors such as pH, turbidity, temperature and nutrition must be considered. If alcoholic fermentation is sluggish or stuck, it may be necessary to add BACTILESS™ (pg 109), or Lysozyme (pg 108). This is especially important if the pH is >3.5. BETA CO-INOC is not recommended for wines with alcohol potential >15% (v/v).

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 (39°F). For long term (>18 months) store at -18°C (0°F).

Alcohol Tolerance: <15%	pH: >3.2	Total SO ₂ at crush: <60 ppm	Temp: <82°F once alcohol >5% (v/v)
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MANAGING VOLATILE ACIDITY PRODUCTION DURING SIMULTANEOUS ALCOHOLIC AND MALOLACTIC FERMENTATION

Adding malolactic bacteria just after inoculating with yeast allows the alcoholic fermentation and malolactic fermentation to occur simultaneously. A simultaneous alcoholic and malolactic fermentation has several benefits. The bacteria slowly acclimate to ethanol, nutrients are not in short supply, and malolactic fermentation finishes faster (compared to when bacteria is added post alcoholic fermentation). This means that wines can be stabilized sooner. In addition, the wines are fresher and fruitier when malolactic fermentation occurs during alcoholic fermentation.

Even though these benefits have been known for many years there is still a concern that this practice will lead to high acetic acid (VA). This is a valid concern as *Oenococcus oeni*, the bacteria used to conduct the malolactic fermentation, can produce acetic acid (VA), ethanol, and lactic acid from glucose. The VA risk can be minimized by following some best practices:

- Choose an ML compatible yeast strain for the alcoholic fermentation (see pgs 12-17)
- Monitor Brix and malic acid depletion during alcoholic fermentation
- Manage the alcoholic fermentation temperature
 - » At inoculation - temperature should not exceed 25°C (78°F)
 - » Alcohol < 6% - temperature should not exceed 35°C (95°F)
 - » Alcohol >6 - 10% - temperature should not exceed 28°C (82°F)
 - » Alcohol >10 - 12% - temperature should not exceed 26°C (79°F)
 - » Alcohol > 12% - temperature should be less than 24°C (75°F)
 - » Alcohol > 14.5% - temperature should be less than <21°C (70°F)

Using BETA CO-INOC™ for co-inoculation has benefits over some of the other direct addition malolactic bacteria in our portfolio. BETA CO-INOC™ is slow to start, so it does not interfere with yeast implantation, but finishes fast. BETA CO-INOC™ preferentially consumes malic acid and once the malic acid has been depleted then citric acid will be consumed. Only after the depletion of the organic acids will the bacteria consume sugar. This preferential uptake of malic acid, then citric acid, then sugar happens irrespective of pH, however at pH>3.5 it will happen quicker than pH<3.5. If the malic acid is gone and there is still residual sugar, then add BACTILESS™ or DELVOZYME to inhibit the bacteria and avoid the production of VA, ethanol, and lactic acid from the remaining glucose.

TIMING OF ADDITION: SEQUENTIAL INOCULATION

Many winemakers prefer to add malolactic bacteria (ML) towards the end of alcoholic 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 alcoholic fermentation, the risk of VA production by ML is minimized. Wines made by sequential inoculation can also give different flavor profiles than co-inoculated wines. Sequential inoculation wine may have higher levels of buttery character (especially when using certain ML strains) and enhanced aromatic complexity.

ALPHA

Oenococcus oeni for aroma complexity and mouthfeel enhancement
White, Red

#15601	2.5 hL (66 gal) dose	\$24.20
#15602	25 hL (660 gal) dose	\$123.00
#15603	250 hL (6,600 gal) dose	\$643.80

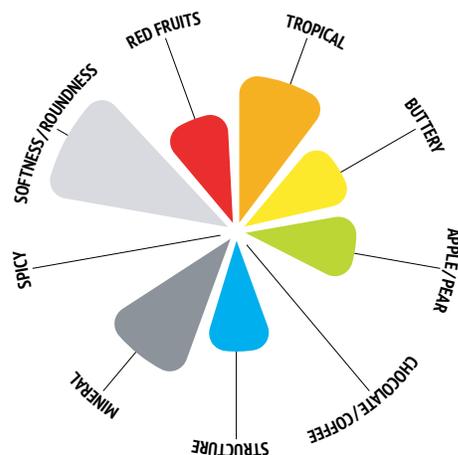
ENOFERM ALPHA™ contributes to wine aroma complexity and mouthfeel in red and white wines. White wines have increased levels of pear, apricot and pineapple aromas. Red wines have more berry, cherry and plum aromas with a softer, rounder mouthfeel and decreased green and vegetative characters.

ALPHA was selected by the Institut Français de la Vigne et du Vin (IFV, formerly ITV) for its high survival rate, dominance during malolactic fermentation and reliability under varied conditions.

This *Oenococcus oeni* strain shows good resistance to botrycides.

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <15.5%	pH: >3.2	Total SO ₂ : <50ppm	Temp: >57°F
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BETA LALLEMAND

Oenococcus oeni for increased diacetyl production, fruit and floral expression, and tannin integration

White, Red

#15604	2.5 hL (66 gal) dose	\$24.20
#15605	25 hL (660 gal) dose	\$123.00
#15606	250 hL (6,600 gal) dose	\$643.80

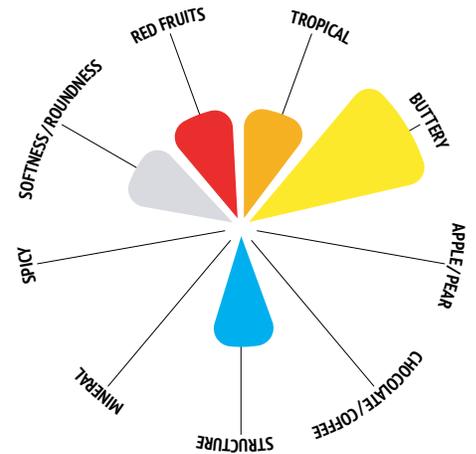
ENOFERM BETA™ preserves and enhances varietal aromas, increases volume and softness, and can impact the diacetyl levels of wines. In white wines buttery aromas and flavors are produced. If the wine is left on the lees, the buttery notes are decreased and tropical fruit aromas like pineapple and mango are evident. In red wines, BETA is used to support tannin structure and red fruit flavors. Compounds such as beta-damascenone and beta-ionone are increased, contributing floral and berry notes.

BETA was isolated in the Abruzzi wine region of Italy for its robustness and aromatic enhancement while respecting grape varietal characteristics.

BETA is a high nutrient demanding strain and benefits from the addition of either ACTI-ML™ (pg 66) or ML RED BOOST™ (pg 66).

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <15%	pH: >3.2	Total SO ₂ : <60ppm	Temp: >57°F
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ELIOS 1 LALLEMAND

Oenococcus oeni for enhanced fresh fruit, spice and tannin integration

Red

#15108	25 hL (660 gal) dose	\$108.90
#15109	250 hL (6,600 gal) dose	\$560.20

LALVIN ELIOS 1™ is suited for Mediterranean, Rhône style and other warm climate red wines for enhanced red fruit aromas, spice, and tannin intensity. Wines have an integrated mouthfeel with good mid-palate intensity, decreased drying sensations and increased freshness.

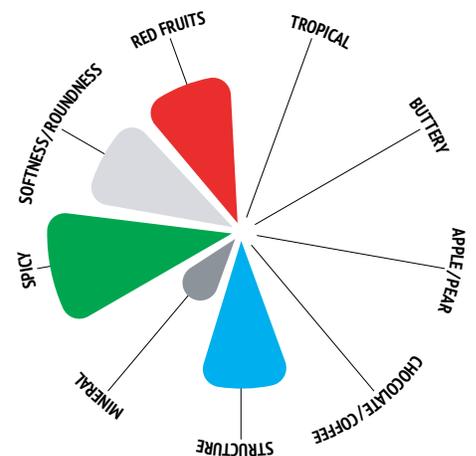
The perception of green and vegetative characters is reduced.

This strain of *O. oeni* was isolated by the Institut Coopératif du Vin (ICV) from a spontaneous malolactic fermentation for its fast implantation and reliable malic acid degradation.

ELIOS 1 has a high capacity to degrade acetaldehyde during malolactic fermentation (MLF) and for a few days after. Since acetaldehyde strongly binds SO₂, using ELIOS 1 to reduce acetaldehyde may make post MLF SO₂ additions more effective.

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance*: <14%	pH: >3.4	Total SO ₂ : <50ppm	Temp: >64°F
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*Alcohol tolerance of ELIOS 1 is improved (up to 15.5%) when the pH>3.5 and TSO₂<35ppm

LALVIN (MBR) 31 LALLEMAND

Oenococcus oeni for balanced sensory and color stability in low pH wine and low temperature ferments

White, Red, Fruit, Cider

#15022	2.5 hL (66 gal) dose	\$24.20
#15032	25 hL (660 gal) dose	\$108.90
#15127	250 hL (6,600 gal) dose	\$560.20

LALVIN 31™ is suitable for cool climate red and white wines, enhancing varietal characters, fruit flavors and promoting color stability. In white wines, it adds complexity due to its light buttery flavor. With lees contact the buttery notes decrease, elevating fruit flavors and mineral notes. In red wines, dark berry fruit flavors, color stability and mouthfeel are increased. Wines made using LALVIN 31 have good body and length.

This *O. oeni* strain was selected by the Institut du Français de la Vigne et du Vin (IFV) in France for its capacity to achieve good and reliable malolactic fermentation under difficult wine conditions such as low pH and low temperature.

LALVIN 31 is tolerant to levels of lactic acid that can be inhibitory to other ML strains.

Due to its high nutrient demand, it is sometimes slow to start but finishes quickly, especially when used in conjunction with OPTIMALO BLANC™ (pg 67) or ML RED BOOST™ (pg 66).

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).

Alcohol Tolerance: <14%	pH: >3.1	Total SO ₂ : <45ppm	Temp: >55°F
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O-MEGA LALLEMAND

Oenococcus oeni strain for strong fermentation, freshness and fruit expression

White, Red

#15615	25hL (660 gal) dose	\$123.00
#15616	250hL (6,600 gal) dose	\$643.80

O-MEGA™ is suitable for fresh fruit expression in high maturity grapes. O-MEGA balances and complements ripe flavors in white wines by bringing freshness, mineral and citrus notes. In red wines it highlights red and dark berries like redcurrant, strawberry, blackcurrant and blackberry. Using this bacteria strain in red wines may help stabilize color due to its slow degradation of acetaldehyde. Although recommended for ripe grapes it does well in cold climate Pinot noirs.

O-MEGA has a late degradation of citric acid resulting in very low diacetyl and low volatile acidity.

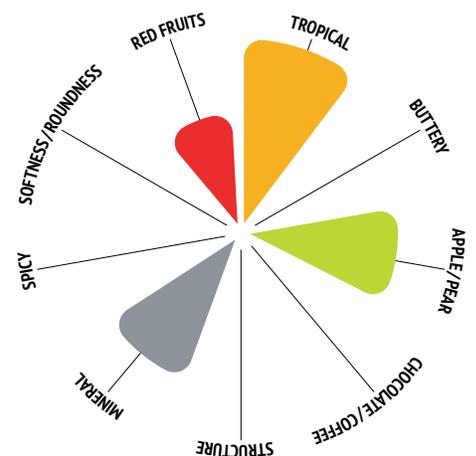
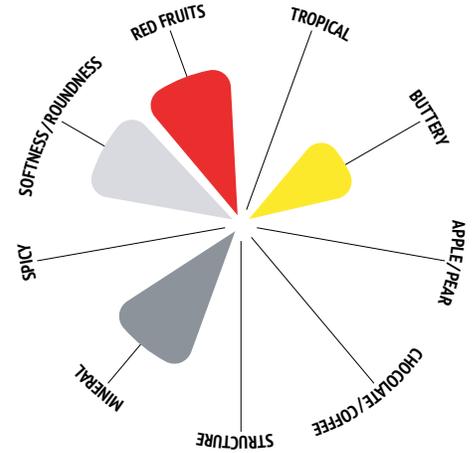
It should not be used in wine with herbaceous or vegetative notes as these will be amplified.

O-MEGA was selected in the south of France by the Institut du Français de la Vigne et du Vin (IFV) in Burgundy for its ability to complete MLF, even under challenging wine conditions of high alcohol, low pH and low temperatures.

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).

Alcohol Tolerance: <16%	pH: >3.1	Total SO ₂ : <60ppm	Temp: >57°F
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Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stabilization
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Cleaning
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Let's Start
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PN4 LALLEMAND

Oenococcus oeni for fast fermentation with enhanced spice, fruit and mouthfeel

Red, White

#15607	25 hL (660 gal) dose	\$123.00
#15608	250 hL (6,600 gal) dose	\$643.80

PN4™ is equally suited to red and white winemaking where it contributes to aromatic complexity, mouthfeel and balance.

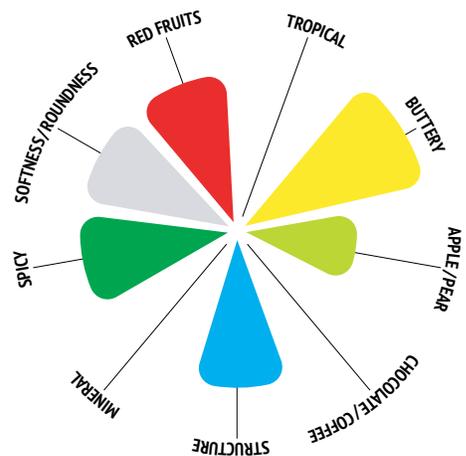
Red wines are described as having increased spiciness with elevated notes of nutmeg, licorice and pepper. General fruit notes of plum, cherry and berry are increased, structure is enhanced and herbaceousness masked.

In tank fermented white wines with minimal lees contact, varietal expression is increased. In barrel fermented white wines notes of honey and butter (diacetyl) are reported, mouthfeel is full and creamy and oak is well-integrated.

PN4 was isolated from a spontaneous malolactic fermentation in a Pinot noir by the Institute of San Michele in the Trentino region of Italy for its fast fermentation kinetics under difficult winemaking conditions. .

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <16%	pH: >3.1	Total SO ₂ : <60ppm	Temp: >61°F
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SILKA LALLEMAND

Oenococcus oeni for silky mouthfeel, aromatic balance and good oak integration

Red

#15624	25 hL (660 gal) dose	\$135.10
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LALVIN SILKA™ is recognized for its positive impact on aromas and mouthfeel.

SILKA accentuates aromas of chocolate, vanilla, and toast, balanced by aromas and flavors of red currant, blackberry and cherry.

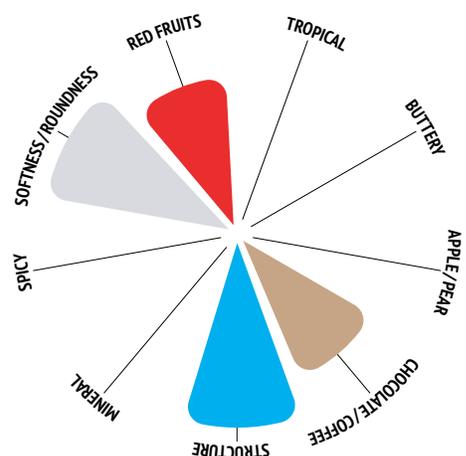
This malolactic bacteria is well-suited for wines fermented and aged on oak where it minimizes astringency and bitterness and masks herbaceous and green flavors resulting in well balanced red wines.

SILKA was isolated in La Rioja, Spain and selected by the Instituto de Ciencias de la Vid y del Vino (ICVV) during an extensive research program for its unique sensory characteristics, steady fermentation kinetics, and tolerance of challenging winemaking environments.

SILKA has a moderate nutrient demand and benefits from the addition of malolactic fermentation nutrient like ML RED BOOST™ (pg 66).

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <16%	pH: >3.3	Total SO ₂ : <60ppm	Temp: >59°F
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SOLO SELECT

Oenococcus oeni for fast fermentation with enhanced structure and spice

Red

#15270

25 hL (660 gal) dose

\$135.10

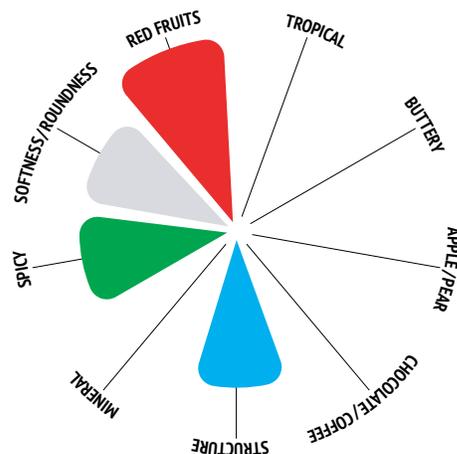
SOLO SELECT is known to enhance dark fruit and spicy notes, structure and complexity. The production of diacetyl and volatile acidity are low due to the late degradation of citric acid.

SOLO SELECT from Anchor Oenology was isolated in the Yarra Valley, Australia and selected by the Australian Wine Research Institute for its good implantation rates and efficient fermentation kinetics, even in challenging conditions.

This strain has a moderate nutrient demand and will benefit from ML RED BOOST™ nutrient (pg 66).

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <16%	pH: >3.2	Total SO ₂ : <50ppm	Temp: >57°F
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VP41

All-purpose *Oenococcus oeni* for enhanced complexity and mouthfeel

Red, White, Rosé

#15048

2.5 hL (66 gal) dose

\$24.20

#15042

25 hL (660 gal) dose

\$108.90

#15044

250 hL (6,600 gal) dose

\$560.20

LALVIN VP41™ is appreciated for its ability to enhance aromatic complexity, richness and mouthfeel in red, white and rosé wines. Red wines have increased currant and berry flavors and aromas, with enhanced coffee and chocolate notes, and sweet tannins. White wines have elevated tropical fruit flavors, apple and pear notes and very low diacetyl levels.

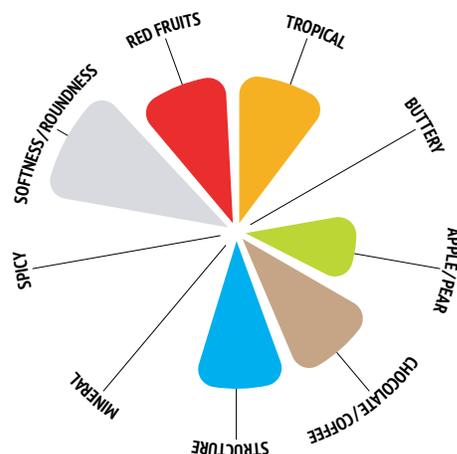
VP41 was isolated in Italy during an extensive European Union collaboration for its strong implantation rate, steady fermentation kinetics, high alcohol tolerance, enhanced mouthfeel and ability to improve wine structure.

At temperatures below 16°C(61°F) it is a slow starter but can complete fermentation.

Recommended strain for restarting stuck malolactic fermentations (see Restart ML protocol page 69).

Usage: Add directly to wine and mix thoroughly.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).



Alcohol Tolerance: <16%	pH: >3.1	Total SO ₂ : <60ppm	Temp: >61°F
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EFFERVESCENT DIRECT ADDITION BACTERIA

MALOTABS

Oenococcus oeni in tablet form for easy barrel additions

White, Red, Rosé

#15049 | 2.5 hL (66 gal) dose (5/box) | \$151.20

MALOTABS™ are an innovative and easy-to-use tablet form of malolactic bacteria designed by Lallemand Oenology for direct addition into barrels.

Red and white wines fermented with MALOTABS show increased fruit, mouthfeel, balance and structure.

MALOTABS dissolve immediately upon addition to the barrel and are self-dispersed throughout the wine.

MALOTABS are produced from a known ML strain developed for good implantation, moderate to fast kinetics, and low volatile acid and diacetyl production.

Usage: Add directly to wine. Once opened, tablets should be used immediately. Keep unused tablets sealed and stored in their original packaging until ready for use.

Storage: Dated expiration. For short term (<18 months) store at 4°C(39°F). For long term (>18 months) store at -18°C(0°F).

Alcohol Tolerance: <16%

pH: >3.2

Total SO₂: <60ppm

Temp: >61°F

MALOLACTIC BACTERIA NUTRITION

The growth and activity of malolactic bacteria is dependent on many factors including wine temperature, pH, SO₂, alcohol, presence of inhibitors and nutrient availability. Malolactic bacteria have complex nutrient needs. If any of the essential nutrients are missing, then malolactic fermentations may struggle or stick completely. Even under ideal conditions, malolactic bacteria grow slowly. Taking care of their nutritional needs will alleviate some of the challenges associated with malolactic fermentation (MLF). We classify our ML strains' relative nutrient requirement as low, medium or high nutrient need. See "Choosing ML Bacteria and Nutrients" chart (pg 59) for more information.

ACTI-ML

Bacteria rehydration nutrient

Reds, Whites and Rosés

#15681 | 1 kg | \$55.50

ACTI-ML™ is a bacteria nutrient used during rehydration. This specialized nutrient is a blend of inactivated yeast rich in amino acids, mineral and vitamins.

ACTI-ML was developed by the Lallemand Oenology Bacteria R&D team led by Dr. Sibylle Krieger-Weber, to strengthen the development of direct inoculation strains of bacteria, especially under difficult conditions.

ACTI-ML is also mixed with cellulose to provide more surface area to help keep bacteria in suspension.

Usage: Mix ACTI-ML into 5 times its weight of 20°C(68°F) chlorine-free water. Add bacteria, then wait 15 minutes before adding the suspension to the wine.

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

Recommended Dosage	20 g/hL	50 g/60 gal	1.7 lb/1000 gal
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ML RED BOOST

Malolactic nutrient for red and stuck malolactic fermentations, OMRI listed

Reds, Restarts

#15218 | 1 kg | \$55.50

ML RED BOOST™ is an advanced bacteria nutrient providing amino acids, peptides, polysaccharides and minerals from specific inactivated yeast.

ML RED BOOST improves the survival rate and the resistance of bacteria against the inhibitory effects of polyphenolic compounds while also compensating for nutritional deficiencies in wine. This results in healthier *O. oeni* and shorter malolactic fermentations.

ML RED BOOST is highly recommended for restarting sluggish and stuck malolactic fermentations (see protocol on pg 69).

Usage: Suspend in small amount of water or wine and then add directly to the wine 24 hours before adding the malolactic bacteria. ML RED BOOST should not be added to the ML rehydration water (if rehydrating ML).

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

Recommended Dosage	20 g/hL	50 g/60 gal	1.7 lb/1000 gal
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OPTI'MALO BLANC



Malolactic nutrient for white and rosé malolactic fermentations;
OMRI listed

White and Rosés

OPTI'MALO BLANC™ is a unique malolactic nutrient specifically formulated for white and rosé wines.

This nutrient is a blend of inactivated yeast, rich in amino acids and specific peptides to help overcome the challenges of malolactic fermentation in white and rosé wines.

OPTI'MALO BLANC can compensate for nutritional deficiencies, stimulate the growth and malic acid metabolism of the bacteria and decrease MLF duration allowing wines to be stabilized quicker.

#15217 | 1 kg | \$55.50

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.

Recommended Dosage	20 g/hL	50 g/60 gal	1.7 lb/1000 gal
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OPTI'MALO PLUS



General malolactic fermentation nutrient

Reds, White and Rosés

OPTI'MALO PLUS™ is a general-purpose malolactic fermentation (MLF) nutrient. It is a blend of inactivated yeasts rich in amino acids, minerals, vitamins, cell wall polysaccharides and cellulose. The cellulose provides surface area to keep the bacteria in suspension and to help adsorb toxic compounds that may be present at the end of alcoholic fermentation.

ML RED BOOST™ (pg 66) is the preferred MLF nutrient over OPTI'MALO PLUS for red wines and OPTI'MALO BLANC™ is preferred for white and rosé wines.

#15141 | 1 kg | \$55.50

Usage: Suspend in a small amount of water or wine and add directly to the wine just before adding the malolactic bacteria. OPTI'MALO PLUS 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.

Recommended Dosage	20 g/hL	50 g/60 gal	1.7 lb/1000 gal
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ARTICLE TROUBLESHOOTING GUIDE FOR SLUGGISH MALOLACTIC FERMENTATIONS

There are many factors that can influence the success of a malolactic fermentation (MLF). Before jumping into a full restart, it is 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 pg 69.

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 OPT'MALO BLANC™ (pgs 66-67).

WINE MIGHT NEED A DETOX

If you have 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 racked after 48 hours (dosage and usage information on page 53).

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 even if they have 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 have 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 have already inoculated, and the wine has low turbidity, it is 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 is 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 ML bacteria.

HOW TO

RECOMMENDED METHOD TO RESTART A STUCK MALOLACTIC FERMENTATION

PREPARE THE STUCK WINE

1. Add 30 g/hL (2.5 lb/1000 gal) of RESKUE™ prior to restarting. Suspend RESKUE in 10 times its weight of warm water 30–37°C (86–98°F) (see pg 53 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).

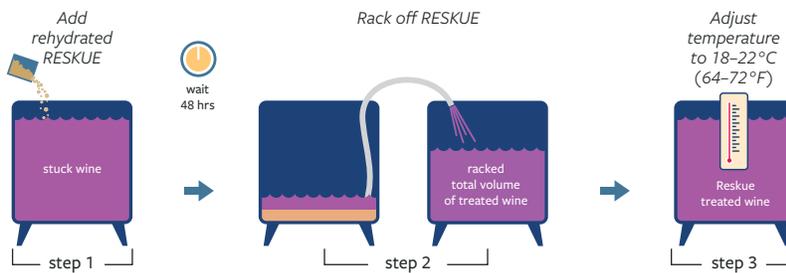
MALOLACTIC BACTERIA NUTRIENT ADDITION

4. Add 20 g/hL (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.

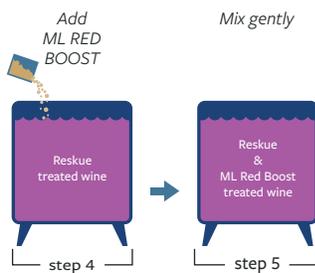
MALOLACTIC BACTERIA ADDITION

6. Add a double dose of LALVIN VP41™ direct inoculation culture (Example: for 1000 gallons, add 3 x 25hL (660 gal) packets).
7. Check for MLF activity by analyzing L-malic acid degradation every 2–4 days.

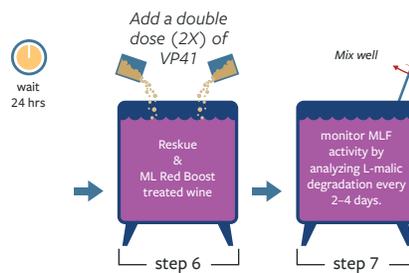
Prepare the Stuck Wine



Malolactic Nutrient Addition



Malolactic Bacteria Addition



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 diacetyl via α -acetolactate (see Figure 1). 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 buttery compounds resulting in fruitier wines.

Using a co-inoculation strategy in white wines 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 scottlab.com.

Figure 1:

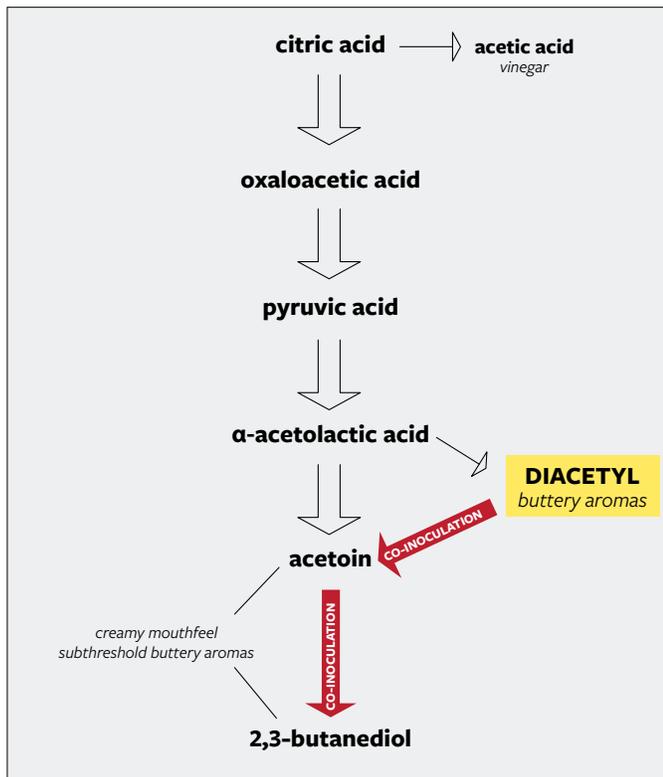
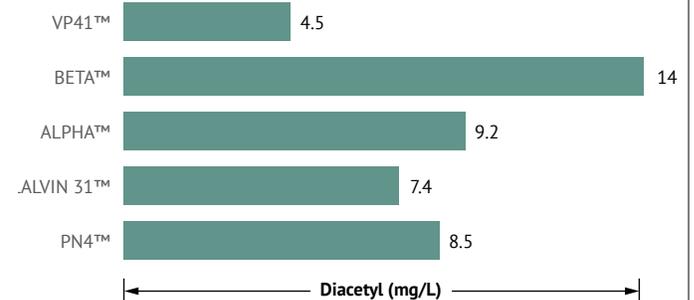


Figure 2:

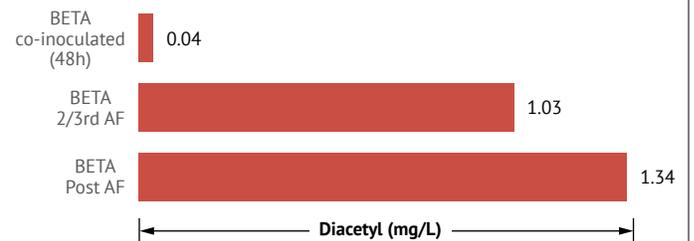
CITRIC ACID METABOLISM
Effect of ML Strain on Diacetyl Concentration in a Sequential Inoculation



Diacetyl concentration of Cabernet Sauvignon (Clare Valley, Australia) with sequential MLF (Bartowsky, AWRI results).

Figure 3:

Effect of ML Inoculation Timing on Diacetyl Concentration in Chardonnay



Impact of the timing of inoculation on diacetyl content in Chardonnay wines

Relative Diacetyl Potential by ML Bacteria Added Post Alcoholic Fermentation

	O-MEGA	VP41	SOLO SELECT	LALVIN 31	ALPHA	SILKA	ELIOS 1	PN4	BETA	
Less Diacetyl	Very low producer	Only attacks citric acid after completion of malic acid	Low producer	Medium to low producer	Medium producer	Medium producer	Medium producer	Early attack of citric acid	High producer when used in sequential inoculation	More Diacetyl

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**. Lallemant Oenology'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?

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. Leaving wine on the lees will also reduce diacetyl levels, as does conducting the MLF at warmer temperatures (24°C/75°F compared to 17°C/63°F). High inoculation levels of strains like O-MEGA™ and LALVIN VP41™, will help control excessive diacetyl production. See article on pg 70 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 before MLF is finished. Citric acid can promote acetic acid in addition to diacetyl formation during malolactic fermentation. If increased diacetyl is the goal, choose a bacteria strain that is a known diacetyl producer such as LALVIN BETA™ or PN4®. See article on pg 70 for more information.

Why is my malolactic fermentation not finishing?

Check wine parameters (free and total SO₂, alcohol, pH, VA, malic acid 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 juice or wine can also inhibit malolactic bacteria, as can lack of essential nutrients. See "Troubleshooting Guide for Malolactic Fermentations" on pg 68 for more information.

When is my ML 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.

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 pgs 12-17 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 pg 59 and "Troubleshooting Guide for Malolactic Fermentations" on pg 68 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 ML strain (see pg 59 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 pg 68 to make sure that all the factors have been considered.

I'm thinking of trying co-inoculation. Which bacteria strain should I use?

BETA CO-INOC™ (pg 60) was developed by Lallemant Oenology for use in co-inoculation. Due to its slow growth, there is less risk of malolactic fermentation finishing before primary. Therefore, there is also less risk of volatile acid production resulting in timely completion of both fermentations.

If I am doing a co-inoculation, which bacteria nutrient do I need? When should I add it, and how much should I add?

As long as you have a good yeast nutrient strategy and add complex nutrients for primary fermentation, additional ML nutrients aren't always necessary. If wine conditions are very difficult — low pH (<3.2), high alcohol (>15.5% v/v), high SO₂ (>45 mg/L total or 5 mg/L free SO₂) — and MLF has not started by the end of alcoholic fermentation, ML nutrient additions are recommended. Add 20 g/hL of ML RED BOOST™ (pg 66) for structured red wines or 20 g/hL OPTI'MALO BLANC™ (pg 67) 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 and European, toasted and 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 and 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 lack structure, complexity and balance.

STABILITY	STRUCTURE AND BALANCE	AROMA
<p>Fermentation tannins, which are generally a mix of condensed and ellagic tannins, 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 <i>Botrytis</i> and other rot. They act as an antioxidant and can inhibit laccase.</p>	<p>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. 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.</p>	<p>The use of tannins and oak can positively impact aromas in almost all stages of wine-making. Tannins can reveal and enhance fruit 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.</p>

CHOOSING OAK AND TANNINS

Winemaking Stage	Wine Type	Goal	Suggested Tannin	Suggested Oak
Incoming grapes and in press	Red, White, Rosé	Minimize <i>Botrytis</i> damage	FT BLANC, FT ROUGE	
	White, Rosé	Limit oxidation	FT BLANC, FT BLANC SOFT, FT BLANC CITRUS	
	White, Rosé	Increase citrus aromas and flavors	FT BLANC CITRUS	
	Red	Increase berry aromas and flavors	FT ROUGE BERRY	
Juice/Must	White, Rosé	Limit oxidation	FT BLANC, FT BLANC SOFT, FT BLANC CITRUS	
	Red, Rosé	Increase berry aromas and flavors	FT ROUGE BERRY, FT ROUGE	
	Red	Limit oxidation, minimize greenness & stabilize color	FT ROUGE, FT ROUGE SOFT, UVA'TAN	FEELWOOD! BALANCE & STRUCTURE, FEELWOOD! SWEET & FRESH
Fermentation	White, Rosé	Enhance freshness	FT BLANC CITRUS	FEELWOOD! SWEET & FRESH
	Red, White, Rosé	Increase fruit expression	FT BLANC CITRUS, FT ROUGE BERRY	FEELWOOD! BALANCE & STRUCTURE, FEELWOOD! SWEET & FRESH, THERMIC FAN PACKS, OAK CUBES
	White, Red	Add oak texture, flavors and aromas		FEELWOOD! BALANCE & STRUCTURE, FEELWOOD! SWEET & FRESH, THERMIC FAN PACK, OAK CUBES
	Red	Minimize greenness	FT ROUGE SOFT, FT ROUGE, FT ROUGE BERRY	FEELWOOD! BALANCE & STRUCTURE
	Red, White, Rosé	Add mid-palate	FT ROUGE, FT BLANC SOFT, UVA'TAN SOFT	FEELWOOD! SWEET & FRESH, THERMIC FAN PACK, OAK CUBES
	Red, White, Rosé	Build structure	FT BLANC, FT BLANC SOFT, FT ROUGE, UVA'TAN	FEELWOOD! BALANCE & STRUCTURE, THERMIC FAN PACKS, OAK CUBES
	Red	Color stability	FT ROUGE, FT COLORMAX, UVA'TAN	
Aging	Red, White	Limit oxidation	ESTATE, FT BLANC	
	White, Rosé	Increase citrus aromas, flavors and freshness	FT BLANC CITRUS	
	Red, Rosé	Increase berry aromas and flavors	ESTATE, FT ROUGE BERRY	THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
	White, Red	Increase oak flavors and aromas		THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
	Red	Minimize greenness	FT ROUGE BERRY	THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
	Red	Enhance mid-palate	ESTATE	THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
	Red, White, Rosé	Soften mouthfeel	FT BLANC SOFT, UVA'TAN SOFT	THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
	Red, White, Rosé	Build structure	ESTATE, FT BLANC SOFT, UVA'TAN	THERMIC FAN PACKS, OAK CUBES, BARREL INSERTS
Finishing (3-6 weeks before bottling)	White, Rosé	Enhance citrus aromas and freshness	FT BLANC CITRUS, FT BLANC	
	Red, White, Rosé	Increase fruit expression	FT BLANC CITRUS, FT ROUGE BERRY,	THERMIC OAK CUBES
	Red, White, Rosé	Increase oak flavors and aromas and sweetness perception	RICHE, RICHE EXTRA	THERMIC OAK CUBES
	Red, White, Rosé	Enhance mid-palate	FT BLANC SOFT, FT ROUGE BERRY, RICHE, RICHE EXTRA	THERMIC OAK CUBES
	Red, White, Rosé	Soften mouthfeel	FT BLANC SOFT, RICHE EXTRA, UVA'TAN SOFT	THERMIC OAK CUBES
	Red	Mask off flavors	RICHE, RICHE EXTRA	THERMIC OAK CUBES
Pre-bottling (2 days before bottling)	Red, White, Rosé	Enhances freshness, reveals fruits, balances mouthfeel	RADIANCE	
	Red, Rosé	Enhances fruit, adds complexity, minimizes greenness	ONYX	
	Red, White	Increases structure, enhances aromatic complexity and masks off odors	ROYAL	
	Red, White, Rosé	Soften mouthfeel	SEE FLASHGUM R LIQUIDE AND ULTIMA SOFT IN FINING AND STABILITY SECTION (pgs 104-105)	

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TANNINS

Tannins can be used in all varieties of wine and in all stages of winemaking to enhance aromas and mouthfeel, stabilize color and add structure. They aren't just for red wines, whites and rosés can also benefit from tannin additions to limit oxidation, enhance freshness, and increase expression of certain flavor profiles. The possibilities are endless!

ESTATE

Enhances fruit, spice and mid-palate

Red

SCOTT'TAN™ ESTATE can enhance mid-palate, aromatic complexity and mouthfeel. Tastings demonstrate that ESTATE can add spiciness and highlight fruit (red and dark). When used in neutral barrels it compensates for the lack of tannins, building mid-palate and enhancing structure.

Usage: During transfer or racking add ESTATE into the wine. Mix well to ensure homogeneity. Following organoleptic evaluations, 2-3 further additions can be made prior to racking. Additions should be made at least 6 weeks before bottling to allow for polymerization and settling.

#15958	1 kg	\$141.10
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Storage: Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

Recommended Dosage

Prior to Barrel Aging Red Wine

50-300 ppm	5-30 g/hL	0.42-2.5 lb/1000 gal
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Prior to Bottling (3-6 weeks) or During Racking

50-100 ppm	5-10 g/hL	0.42-0.83 lb/1000 gal
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Stage of Winemaking: Aging	Minimum Contact Time: 6 weeks	Impact: Aroma and structure
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FT BLANC

Protection from oxidation and early protein removal

White, Rosé, Red, Fruit Wines, Cider

SCOTT'TAN™ FT BLANC tannin is a white gall nut tannin for use on grapes and juice to protect from oxidative browning.

In protein-rich grape varieties such as Sauvignon blanc, FT BLANC can help remove some heat unstable proteins. FT BLANC will also contribute notes of minerality. On *Botrytis* infected grapes an addition of FT BLANC can inhibit laccase damage due to its antioxidant properties.

Usage: 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.

#15954	1 kg	\$51.40
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#15969	5 kg	\$226.70
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Storage: Dated expiration. Unopened, the shelf-life is 5 years at 18°C(65°F). Once opened, keep tightly sealed and dry.

Recommended Dosage

White/Rosé Juice

50-150 ppm	5-15 g/hL	0.42-1.2 lb/1000 gal
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Red Wine

50-300 ppm	5-30 g/hL	0.42-2.5 lb/1000 gal
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Fruit Wine, Cider, Mead

50-200 ppm	5-20 g/hL	0.42-1.6 lb/1000 gal
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White/Rosé Wine*

50-300 ppm	5-30 g/hL	0.42-2.5 lb/1000 gal
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Stage of Winemaking: Pre-fermentation, Finishing	Minimum Contact Time: 3 weeks	Impact: Antioxidant protection and protein removal
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FT BLANC CITRUS

Enhances fruity and floral aromas

White, Rosé, Hybrids, Cider

SCOTT'TAN™ FT BLANC CITRUS is a mixture of condensed tannins from citrus wood and gall nuts. The use of FT BLANC CITRUS during alcoholic fermentation increases wine aromas, especially when used in combination with yeast strains that have beta-glycosidase activity (See yeast section pgs 12-17). Resulting wines present more intense aromas of lemon, grapefruit, apple and white flowers. FT BLANC CITRUS also protects the juice and wine from oxidation.

Usage: Dissolve FT BLANC CITRUS in about 10 times its weight of warm water (35–40°C/95–104°F) then add it to the juice/wine and mix well. If using during alcoholic fermentation add 24–48 hours after yeast inoculation. Final additions should be made at least 3 weeks prior to bottling.

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

Stage of Winemaking: Pre-fermentation, Finishing	Minimum Contact Time: 3 weeks	Impact: Aromatic Enhancement
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#15974	1 kg	\$118.90
#15975	5 kg	\$508.80

Recommended Dosage

White Juice, Cider

20–150 ppm	2–15 g/hL	0.17–1.2 lb/1000 gal
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Rosé Juice

50–150 ppm	5–15 g/hL	0.42–1.2 lb/1000 gal
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White or Rosé Wine

50–100 ppm	5–10 g/hL	0.42–0.83 lb/1000 gal
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FT BLANC SOFT

Oxidation protection and mouthfeel enhancement

White, Rosé, Red, Hybrids, Fruit Wine, Cider, Mead

SCOTT'TAN™ FT BLANC SOFT combines the benefits of FT BLANC (see pg 74) with improved softness and mouthfeel. White and rosé wines made with FT BLANC SOFT have enhanced texture with a perception of sweetness. Relatively small dosages can contribute to minerality. Similar improvements can be seen in fruit wines and mead.

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.

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

Stage of Winemaking: Pre-fermentation, Finishing	Minimum Contact Time: 3 weeks	Impact: Antioxidant and Mouthfeel
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#15955	1 kg	\$74.60
#15980	5 kg	\$333.50

Recommended Dosage

White/Rosé Juice

50–150 ppm	5–15 g/hL	0.42–1.2 lb/1000 gal
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Red Wine

50–300 ppm	5–30 g/hL	0.42–2.5 lb/1000 gal
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Fruit Wine, Cider, Mead

50–200 ppm	5–20 g/hL	0.42–1.6 lb/1000 gal
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White/Rosé Wine

50–300 ppm	5–30 g/hL	0.42–2.5 lb/1000 gal
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FT COLORMAX

Promote color stability

Red, Hybrids, Fruit Wine

SCOTT'TAN™ FT COLORMAX is a natural catechin product developed for its superior ability to stabilize color. Its special formulation goes into solution more easily than conventional fermentation tannin products. It is intended for use in conjunction with FT ROUGE or FT ROUGE SOFT (pgs 76-77).

Usage: Add FT COLORMAX at 1/3 sugar depletion during alcoholic fermentation. If a cold soak has been done, add FT

#15968	1 kg	\$66.50
Recommended Dosage		
Red Must		
100–300 ppm	10–30 g/hL	0.8–2.5 lb/1000 gal

Stage of Winemaking: Fermentation	Contact Time: During fermentation	Impact: Color Stability
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FT ROUGE

Promotes color, structure and fruit

Red, Fruit Wine

SCOTT'TAN™ FT ROUGE is a tannin blend of highly reactive tannins derived from exotic woods and chestnut. The addition of FT ROUGE at the beginning of red wine fermentations helps preserve the grapes' natural tannins so they can combine with anthocyanins for optimal color stability. Mouthfeel is also enhanced. FT ROUGE provides some antioxidative protection. For maximum antioxidant protection in the case of mold damage and high laccase potential, SCOTT'TAN FT BLANC (pg 74) is the preferred tannin.

Usage: 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 wait-

#15950	1 kg	\$41.40
#15951	5 kg	\$164.30

ing 3–6 weeks after the tannin addition before racking, fining, filtering or bottling.

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

Recommended Dosage		
Red <i>Vinifera</i> Must		
200–500 ppm	20–50 g/hL	1.6–4.0 lb/1000 gal
Red Non-<i>Vinifera</i> Must		
300–600 ppm	30–60 g/hL	2.5–5.0 lb/1000 gal
Fruit		
200–500 ppm	20–50 g/hL	1.6–4.0 lb/1000 gal

Stage of Winemaking: Fermentation	Contact Time: During fermentation	Impact: Color Stability; Structure
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FT ROUGE BERRY

Enhances red berry fruit, diminishes vegetative notes

Rosé, Red, Hybrids

SCOTT'TAN™ FT ROUGE BERRY is a mixture of condensed tannins that enhances strawberry, cherry and blueberry aromas. FT ROUGE BERRY increases and protects classical varietal flavors and aromas and masks green/vegetative notes. To further enhance berry flavors, conduct the alcoholic fermentation with a yeast strain with beta-glycosidase enzyme activity (See yeast section pgs 12-17).

FT ROUGE BERRY is beneficial for low aromatic and low color varietals to bring flavor, aromas, and color stability.

Usage: Dissolve FT ROUGE BERRY in about 10 times its weight of warm water (35–40°C/95–104°F) then add it to the must/wine and mix well. If using during alcoholic fermentation add 24–48 hours after yeast inoculation. When used post alcoholic fermentation add it to the wine and mix well. Final

#15972	1 kg	\$118.90
#15973	5 kg	\$508.80

additions should be made at least 3 weeks prior to bottling.

Storage: Dated expiration. Unopened, store in a cool dry, ventilated area. Once opened, keep tightly sealed and dry.

Recommended Dosage		
Rosé Must		
20–150 ppm	2–15 g/hL	0.17–1.2 lb/1000 gal
Red Must		
50–200 ppm	5–20 g/hL	0.42–1.6 lb/1000 gal
Red Wine		
50–200 ppm	5–20 g/hL	0.42–1.6 lb/1000 gal

Stage of Winemaking: Fermentation, Finishing	Minimum Contact Time: 3 weeks	Impact: Aromatic enhancement
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FT ROUGE SOFT

Promotes color, mouthfeel and fruit

Red, Fruit Wine

SCOTT'TAN™ FT ROUGE SOFT is appreciated for its ability to highlight fruit aromas and flavors, and softness.

FT ROUGE SOFT additions results in stable color and integrates well. FT ROUGE SOFT is respectful and does not leave an obvious tannin addition impression. Mouthfeel and roundness are improved, and bitterness is reduced.

FT ROUGE SOFT provides antioxidative protection.

Usage: Add to the grapes at the crusher or add to the must during a pump-over. Ensure tannin is mixed in well after addition. 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,

#15952	1 kg	\$46.40
#15953	5 kg	\$176.40

filtering or bottling.

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

Recommended Dosage

Red *Vinifera* Must

200–500 ppm	20–50 g/hL	1.6–4.0 lb/1000 gal
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Red Non-*Vinifera* Must

300–600 ppm	30–60 g/hL	2.5–5.0 lb/1000 gal
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Fruit

200–500 ppm	20–50 g/hL	1.6–4.0 lb/1000 gal
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Stage of Winemaking: Fermentation	Contact Time: During fermentation	Impact: Color Stability, Mouthfeel
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ONYX

Enhances red fruit, berry aromas and minimizes greenness

Red, Rosé, Hybrids

SCOTT'TAN™ ONYX is derived from French oak. It can be used in red and rosé wines to bring out berry and sweet red fruit notes. ONYX respects varietal characteristics but adds complexity and minimizes greenness. It helps soften and integrate flavors.

ONYX integrates rapidly and is great for “last-minute” additions. It can be added up to 48 hours before membrane (final) filtration. Always conduct filterability trials prior to addition to avoid filtration challenges.

#15977	250 g	\$146.10
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Usage: Dissolve ONYX in about ten times its weight of warm water 35–40°C(95–104°F) until fully dissolved. Add to wine gradually during a transfer or pump-over. Good mixing is important.

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

Recommended Dosage

10–100 ppm	1–10 g/hL	0.08–0.83 lb/1000 gal
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Stage of Winemaking: Pre-bottling	Minimum Contact Time: 48 hours	Impact: Complexity, Integration
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RADIANCE

Enhances freshness, reveals fruit and oak aromas

White, Red, Rosé, Cider

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. It can be added up to 48 hours before membrane (final) filtration. Always conduct filterability trials prior to addition to avoid filtration challenges.

#15978	250 g	\$146.10
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Usage: Dissolve RADIANCE in about ten times its weight of warm water 35–40°C(95–104°F) until fully dissolved. Add to wine gradually during a transfer or pump-over. Good mixing is important.

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

Recommended Dosage

10–100 ppm	1–10 g/hL	0.08–0.83 lb/1000 gal
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Stage of Winemaking: Pre-bottling	Minimum Contact Time: 48 hours	Impact: Mouthfeel, Aromas
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RICHE

Sweetness and finesse

White, Rosé, Red, Hybrids

SCOTT'TAN™ RICHE is notable for enhancing aromatic 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.

#15962

500 g

\$147.10

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

Recommended Dosage

White/Rosé Wine

30–100 ppm	3–10 g/hL	0.25–0.83 lb/1000 gal
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Red Wine

30–200 ppm	3–20 g/hL	0.25–1.6 lb/1000 gal
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Stage of Winemaking: Finishing

Minimum Contact Time: 3 weeks

Impact: Aroma, Mouthfeel

RICHE EXTRA

Smoothness and richness

Red, White, Hybrids

SCOTT'TAN™ RICHE EXTRA is 100% toasted American oak. This 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.

#15963

500 g

\$209.60

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

Recommended Dosage

White/Rosé Wine

30–100 ppm	3–10 g/hL	0.25–0.83 lb/1000 gal
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Red Wine

30–200 ppm	3–20 g/hL	0.25–1.6 lb/1000 gal
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Stage of Winemaking: Finishing

Minimum Contact Time: 3 weeks

Impact: Aroma, Mouthfeel

ROYAL

Increases structure, enhances aromatic complexity and masks off odors

White, Red

SCOTT'TAN™ ROYAL may be used in red and white wines to add structure, balance and length on the palate. ROYAL is extracted from American oak and complements wines aged in used American oak barrels. It is known to bring out hints of cocoa, chocolate, coffee and butterscotch. ROYAL has also been known to help mask off-aromas and flavors of *Brettanomyces*.

ROYAL integrates rapidly and is great for “last-minute” additions. It can be added up to 48 hours before membrane (final) filtration. Always conduct filterability trials prior to addition to avoid filtration challenges.

#15979

250 g

\$146.10

Usage: Dissolve ROYAL in about 10 times its weight of warm water 35–40°C(95–104°F) until fully dissolved. Add to wine gradually during a transfer or pump-over. Good mixing is important.

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

Recommended Dosage

10–100 ppm	1–10 g/hL	0.08–0.83 lb/1000 gal
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Stage of Winemaking: Pre-bottling

Minimum Contact Time: 48 hours

Impact: Structure, Balance

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UVA'TAN

Grape seed and skin tannin to compensate for tannin deficiencies and add structure

Red, White, Rosé

SCOTT'TAN™ UVA'TAN is composed entirely of grape seed and grape skin tannins. It is high in polyphenols and low in astringency. UVA'TAN can be used during all stages of winemaking and can increase the tannin content of wines, stabilize color, enhance structure and protect against oxidation. In vintages when grape tannin content is low, seeds are unripe, or in cases where over-ripe grapes were watered-back, UVA'TAN can compensate for tannin deficiency. UVA'TAN assists with oak tannin integration when used during barrel aging.

If UVA'TAN is used late in the winemaking process UVA'TAN additions should be made at least six weeks before bottling. 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. Fi-

#15964	500 g	\$190.50
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nal additions can be made up to three weeks before bottling, though six weeks are recommended for 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.

Recommended Dosage

Red Must

50–400 ppm	5–40 g/hL	0.42–3.3 lb/1000 gal
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White Wine

50–150 ppm	5–15 g/hL	0.42–1.2 lb/1000 gal
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Rosé Wine

50–200 ppm	5–20 g/hL	0.42–1.6 lb/1000 gal
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Red Wine

50–300 ppm	5–30 g/hL	0.42–2.5 lb/1000 gal
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Stage of Winemaking: Fermentation, Aging	Minimum Contact Time: 6 weeks	Impact: Compensates for tannin deficiencies, adds structure
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UVA'TAN SOFT

Grape skin tannin for mouthfeel enhancement and balancing oak

Red, White, Rosé

SCOTT'TAN™ UVA'TAN SOFT is prepared from freshly pressed white grapes. These grape skin tannins are highly reactive. Like UVA'TAN, UVA'TAN SOFT can be used at all stages of winemaking. UVA'TAN SOFT is useful when grapes' native tannins are deficient, and mouthfeel is lacking. Due to lack of catechins, UVA'TAN SOFT positively impacts mouthfeel, increasing roundness and softness without imparting bitterness. The grape skin tannins in UVA'TAN SOFT assist with the integration of oak tannins during barrel aging.

Additions of UVA'TAN SOFT should be made at least six weeks before bottling. 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 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. Fi-

#15965	500 g	\$212.60
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nal additions can be made up to three weeks before bottling, though six weeks are recommended for 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.

Recommended Dosage

Red Must

50–400 ppm	5–40 g/hL	0.42–3.3 lb/1000 gal
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White Wine

50–150 ppm	5–15 g/hL	0.42–1.2 lb/1000 gal
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Rosé Wine

50–200 ppm	5–20 g/hL	0.42–1.6 lb/1000 gal
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Red Wine

50–300 ppm	5–30 g/hL	0.42–2.5 lb/1000 gal
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Stage of Winemaking: Fermentation, Aging	Minimum Contact Time: 6 weeks	Impact: Round, smooth mouth and oak integration
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OAK CHIPS

FEELWOOD! BALANCE & STRUCTURE

#15942 | 10kg (2 x 5kg units) | \$120.90

Boosts ripe fruit, masks vegetative characteristics

Red, White, Rosé

FEELWOOD! BALANCE & STRUCTURE oak chips are used during fermentation to minimize harsh and astringent characters in fruit. Herbaceous notes are minimized while fruit aromatics are amplified. Initial volume and mid-palate sweetness are enhanced. These 100% French oak chips are aged for 24 months and are a blend of toast levels (untoasted, light, medium).

Usage: For whites and rosés, chips must be used with infusion bags. For reds, add into the tank while filling or by using infusion bags.

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

Recommended Dosage

Whites, Rosé

0.5-1 g/L	50-100 g/hL	4.15-8.3 lb/1000 gal
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Reds

1-3 g/L	100-300 g/hL	8.3-25 lb/1000 gal
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Stage of Winemaking: Fermentation

Minimum Contact Time: 2 weeks

Impact: Minimize Herbaceousness, Enhance Structure

FEELWOOD! SWEET & FRESH

#15940 | 10kg (2 x 5kg units) | \$90.70

Enhances fruit profile, sweetness and length

Red, White, Rosé

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.

Usage: For whites and rosés, chips must be used with infusion bags. For reds, add into the tank while filling or by using infusion bags.

Storage: Dated expiration. Unopened, the shelf-life is 4 years

at 25°C(77°F). Once opened, keep tightly sealed and dry.

Recommended Dosage

White, Rosé

0.5-1 g/L	50-100 g/hL	4.15- 8.3 lb/1000 gal
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Reds

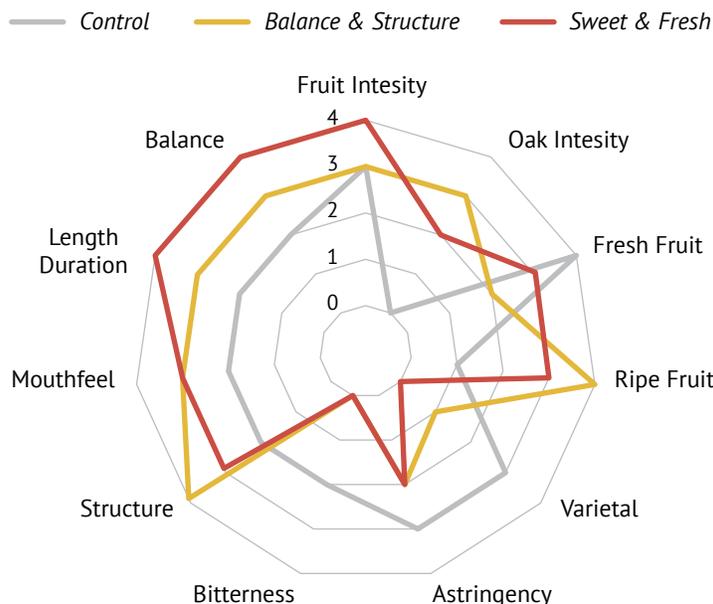
1-3 g/L	100-300 g/hL	8.3 - 25 lb/1000 gal
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Stage of Winemaking: Fermentation

Minimum Contact Time: 2 weeks

Impact: Enhance Fruit, Sweetness, Length

Impact of FEELWOOD! Oak Chips on Merlot



Impact of 3 g/L FEELWOOD! BALANCE & STRUCTURE and SWEET & FRESH on the flavor and aroma profile of a 2018 Merlot from Bordeaux, France- 2 week contact time.

OAK INFUSION PRODUCTS/BARREL ALTERNATIVES

Oak has been used to ferment and store wine for centuries. Oak impacts wine color, aroma, flavor, 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.

To meet these demands of the industry, Scott Laboratories launched THE OAK LAB™ to provide winemakers with the highest quality oak infusion products on the market. The THERMIC line of products includes different oak toasts and formats and using them alone, or in conjunction with our full range of SCOTT'TAN™ tannins, gives winemakers the freedom to craft wines that achieve their precise & consistent oak profiles.

THERMIC

Oak infusion products that provide consistent oak flavors, structure, and mouthfeel

Red, White, Rosé

THE OAK LAB™ THERMIC range of oak infusion products are produced using a specific type of thermal modification resulting in a wide spectrum of flavor profiles. THERMIC products come in three formats and five distinct profiles (see descriptions below) offering consistent and reproducible results. THERMIC profiles can be used on their own or blended to produce the desired oak characteristics.

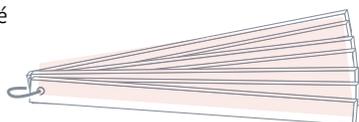
We believe the THERMIC range of oak infusion products are the most consistent range of oak infusion products on the market. This is due to the unique production process, oak quality and oak sourcing. Your wine matrix will change each year, but THERMIC will not!

THERMIC Color Profile	1	2	3	4	5
	THERMIC 1	THERMIC 2	THERMIC 3	THERMIC 4	THERMIC 5
Aroma	Coconut, sweet oak	Nutty, toasty, toffee	Vanilla, dark fruits, complexity	Warm spice, vanilla	Espresso, smoked meat, complexity
Mouthfeel	Fresh and light, addition of length	Rounding, boost of mid-palate	Texture, weight, volume, length	Full, viscous, rich	Balanced, rich, round

THE OAK LAB THERMIC FAN PACK

Classical oak infusion format for structural and aroma enhancement; slow extraction

Red, White, Rosé



THERMIC COLOR PROFILE's 1-5 fan packs are used during fermentation and aging allowing you to achieve your oak flavor, aroma and structure goals. Fan packs are sometimes preferred over other formats due to the slower release of volatile compounds which results in a less immediately impactful and more subtle integration of oak compounds. Depending on oak style goals, color profiles may be used alone or in combination with other profiles.

Fan packs can remain in contact with the wine for up to 18 months. Wine must be tasted and evaluated frequently to determine exact contact time.

Fan packs are bound by food grade nylon zip ties to allow for easy installation and removal. Each fan pack has a surface area

THERMIC Color 1 Fan Pack	#Kb2110	15lb	\$90.00
THERMIC Color 2 Fan Pack	#Kb2120	15lb	\$90.00
THERMIC Color 3 Fan Pack	#Kb2130	15lb	\$90.00
THERMIC Color 4 Fan Pack	#Kb2140	15lb	\$90.00
THERMIC Color 5 Fan Pack	#Kb2150	15lb	\$90.00

of 20 sq. ft, there are 20 fans per pack and each fan within the pack is 36"x 1 1/16" x 13/16". All profiles are 100% Pennsylvania American white oak (*Quercus alba*).

Usage: Attach the zip-tie to the D-rings that may be pre-installed on tank walls. When fan packs are used during fermentation, ensure that the staves remain well below the cap.

Storage: Store in a cool, dry, odor free environment below 25°C (77°F). Keep tightly sealed and dry until ready to use. Once opened use immediately.

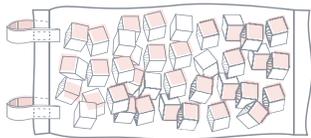
Recommended Dosage

3.6-14.4g/L	2-8 fan packs/1000 gal	30-120lb/1000 gal
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THE OAK LAB THERMIC OAK CUBES

Oak infusion format for structural and aroma enhancement; fast extraction

Red, White, Rosé



THERMIC COLOR PROFILE's 1-5 oak cubes are used during fermentation, aging and finishing. Oak cubes are recommended for fast extraction of aroma, flavor and structural components and are particularly useful for fast, targeted pre-bottling adjustments. Depending on oak style goals, color profiles may be used alone or in combination with other profiles. Oak cubes can remain in contact with the wine for up to 9 months.

Wine must be tasted and evaluated frequently to determine exact contact time.

Oak cubes are packaged in food grade mesh bags. The bags have rugged handles to allow for easy tank installation and removal. The oak has a surface area of 34 sq. ft, the oak cube

THERMIC Color 1 Oak Cubes	#Kb3110	20lb	\$200.00
THERMIC Color 2 Oak Cubes	#Kb3120	20lb	\$200.00
THERMIC Color 3 Oak Cubes	#Kb3130	20lb	\$200.00
THERMIC Color 4 Oak Cubes	#Kb3140	20lb	\$200.00
THERMIC Color 5 Oak Cubes	#Kb3150	20lb	\$200.00

dimensions are 1" x 1 1/16" x 13/16". All profiles are 100% Pennsylvanian American white oak (*Quercus alba*).

Usage: Attach the handle on the mesh bag to the D-rings that may be pre-installed on tank walls. When used during fermentation ensure that the cubes remain well below the cap.

Storage: Store in a cool dry, odor free environment below 25°C(77°F). Keep tightly sealed and dry until ready to use. Once opened use immediately.

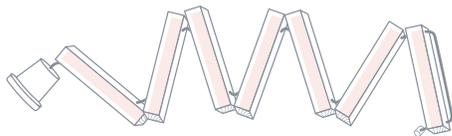
Recommended Dosage

4.8-19.2 g/L	2-8 cube bags/1000 gal	40-160 lb/1000gal
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THE OAK LAB THERMIC BARREL INSERTS/SLEEVES

Oak infusion for wine fermented and aged in barrels

Red, White, Rosé



THERMIC COLOR PROFILE's 1-5 barrel inserts are added into barrels to infuse new oak into wines during fermentation, aging and finishing. THERMIC barrel inserts enhance structure and impact oak flavors and aromas. Barrel inserts should remain in contact with the wine from 3-12 months. Wine must be tasted and evaluated frequently to determine exact contact time. The longer the contact time the greater the impact.

Barrel inserts contain 20 sections, contained within food grade mesh netting, and an eyelet screw for easy attachment to barrel bungs. The oak has a surface area of 5.5 sq. ft, each

THERMIC Color 1 Barrel Inserts	#Kb4110	3.5lb	\$80.00
THERMIC Color 2 Barrel Inserts	#Kb4120	3.5lb	\$80.00
THERMIC Color 3 Barrel Inserts	#Kb4130	3.5lb	\$80.00
THERMIC Color 4 Barrel Inserts	#Kb4140	3.5lb	\$80.00
THERMIC Color 5 Barrel Inserts	#Kb4150	3.5lb	\$80.00

section is 9" x 1 1/16" x 13/16". All profiles are 100% Pennsylvanian American white oak (*Quercus alba*).

Usage: Attach the eyelet screw to barrel bung and insert into barrel.

Storage: Store in a cool dry, odor free environment below 25°C(77°F). Keep tightly sealed and dry until ready to use. Once opened use immediately.

Recommended Dosage	1 insert/60 gallon barrel
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FREQUENTLY ASKED QUESTIONS: OAK & TANNINS

I am using tannins, enzymes and SO₂. Can I add them at the same time?

Using all three products together is fine, but timing is important! High SO₂ content can inhibit 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 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.

Can I use tannins or oak on white and rosé juice and wine?

Yes. A tannin or oak addition is beneficial in white juice to remove off-aromas, improve clarification, inhibit laccase activity from *Botrytis* or rot, and serve as an antioxidant. Sweet oak characters or toasted oak characters can be imparted depending on the oak profile. (see choosing chart on pg 73).

Why should I use tannins on my red grapes since red grapes have tannins?

Tannins can be used to protect the color and phenolic structure of your wines. For the easiest and most efficient integration of tannins, add at the crusher. If needed, an addition of tannin prior to aging can help reinforce phenolic balance. During long maturation in barrels, tannins will help prevent excessive oxidation that can result in loss of structure and freshness. For improved SO₂ management add small amounts of SCOTT'TAN ESTATE (5–7.5 g/hL) during each racking.

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

Tannins do not add color to the must of low color grapes. Research indicates that early addition of tannins, such as SCOTT'TAN FT ROUGE, binds up available proteins. This preserves grapes' 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 alcoholic fermentation?

If increased tannin structure and flavor is desired post-fermentation, make additions with SCOTT'TAN UVA'TAN or SCOTT'TAN ESTATE. 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. For last minute additions SCOTT'TAN ONYX, SCOTT'TAN

RADIANCE or SCOTT'TAN ROYAL can be used. Post alcoholic fermentation bench trials should be conducted to determine most suitable tannin/oak product and the correct dosage.

Will adding tannins or oak inhibit barrel aging?

No. Tannins and oak infusion products protect wine from oxidation during barrel aging, help integrate tannins extracted from oak, increase aroma complexity and balance mouthfeel. The wood tannins extracted from a new barrel protect the wine from over-oxidation during the slow process needed for tannin polymerization and wine development. When using older barrels, indigenous tannin may be depleted. A small tannin addition of 5–10 g/hL of SCOTT'TAN UVA'TAN or SCOTT'TAN ESTATE will increase the phenolic content and protect the wine. Alternatively, an oak infusion barrel insert can be used.

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 only want to use pure grape tannin in my wine?

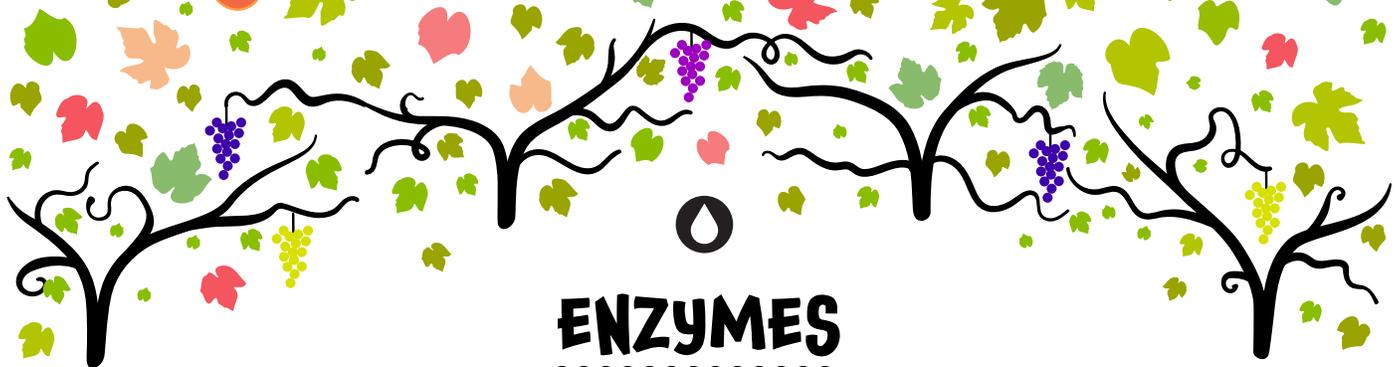
SCOTT'TAN UVA'TAN (tannins from grape skins and seeds) and SCOTT'TAN UVA'TAN SOFT (tannins from white grape skins only) are comprised of 100% grape tannin.

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, which increases their solubility. This means that they can safely be added without the worry of precipitation.

Will SCOTT'TAN ONYX, RADIANCE and ROYAL cause filtration problems?

No filtration problems have been reported when the filtration occurs 48 hours after the tannin addition.



ENZYMES

Enzymes have been used in the fruit industry since the 1930s. In the early days, enzymes for grapes were basic pectinases, were poorly understood and used primarily for increasing juice yields. After decades of research, Scott Laboratories started offering specialized enzymes for the wine industry and has done so for the past 30 years. These enzymes can accelerate a variety of natural reactions that would otherwise occur slowly in grapes, juice, must and wine. They can be used to increase yield before fermentation, improve aromas and mouthfeel and make clarification and filtration easier.

At the heart of many enzyme-solvable problems is pectin. Grape skins and grape pulp are rich in pectins which are linked together with other structural molecules such as cellulose and hemicellulose. In addition to this complexing, pectin itself can be highly branched with many side chains, necessitating multiple formulations for different winemaking applications. 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:

VARIETAL OPTIMIZATION	PRESSING & CLARIFICATION	COLOR & PHENOLICS	MOUTHFEEL
Skin contact enzymes can help release bound aroma precursors into the must or juice.	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.	Enzymes accelerate the release of anthocyanins and tannins resulting in wines with brighter, more stable color and enhanced structure.	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.
AROMA REVEALING	SUGAR LEVEL	FILTRATION	
Aroma compounds, if not released from their precursor form, can be undetectable. Some enzymes have the ability to release these compounds.	Enological beta-glucosidase/glycosidase enzymes are inhibited by sugar. It is recommended that these enzymes are used once the glucose level is <5%.	Grapes impacted by <i>Botrytis</i> 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.	

CHOOSING ENZYMES

Let's Start

Winemaking Stage	Wine Type	Winemaking Goal	Recommended Enzymes
Incoming Grapes /Fruit and In Press	White, Rosé	Increase aromas from white and rosé grapes	LALLZYME CUVÉE BLANC™, RAPIDASE® REVELATION AROMA, RAPIDASE® EXPRESSION AROMA
	White, Rosé	Increase juice yield, higher quality free-run and some aroma enhancement	RAPIDASE® EXPRESSION AROMA, SCOTTZYME® PEC5L, SCOTTZYME® CINN-FREE
	Muscat, Hybrid, American grapes Hard to Press, Fruit Wines	Increase juice yield, reduced solids and improved filtration efficiency	SCOTTZYME® HC in conjunction with SCOTTZYME® PEC5L, RAPIDASE® EXPRESSION AROMA

Vineyard

Yeast

Juice/Must	White, Rosé	Increase aromas and flavors	RAPIDASE® REVELATION AROMA, SCOTTZYME® CINN-FREE
	White, Rosé	Faster settling, decrease solids, compact lees and some aroma increase	RAPIDASE® CLEAR EXTREME, SCOTTZYME® PEC5L, SCOTTZYME® KS, SCOTTZYME® CINN-FREE
	Muscat, Hybrid, American grapes Hard to Press, Fruit Wines	Faster settling, decrease solids, compact lees and some aroma increase	RAPIDASE® CLEAR EXTREME, SCOTTZYME® PEC5L in conjunction with SCOTTZYME® HC, SCOTTZYME® KS

Yeast Nutrients

Malolactic Fermentation

Must	Reds	Increase fruit aromas and color stability, decrease herbaceous aromas and aggressive tannins	SCOTTZYME® COLOR PRO, LALLZYME EX™
	Reds	Increase aroma complexity, color and structure. Decrease skin contact time (faster to press)	LALLZYME EX-V™, SCOTTZYME® COLOR-PRO

Oak & Tannins

Enzymes

Flotation	White, Rosé	Optimize depectinization and processing time for flotation	RAPIDASE® CLEAR EXTREME, SCOTTZYME® PEC5L
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Fermentation	White, Rosé	Compact lees, increase filtration efficiency, minimize loss	SCOTTZYME® KS, SCOTTZYME® PEC5L
	Cider, Fruit Wines or Mead	Compact lees, increase filtration efficiency, minimize loss	SCOTTZYME® SPECTRUM, SCOTTZYME® HC in conjunction SCOTTZYME® PEC5L
	Botrytis-affected fruit	Break-down glucans, improve settling and filtration efficiency	LALLZYME MMX™

Fining & Stability

Microbial Control

Post Fermentation	All	Increase aromas and complexity	RAPIDASE® REVELATION AROMA, SCOTTZYME® BG
	All	Increase body, perception of sweetness and speed up autolysis	LALLZYME MMX™
	All	Improve clarity, increase filtration efficiency and minimize loss	SCOTTZYME® KS, SCOTTZYME® SPECTRUM
	Non-grape wines	Improve clarity, filtration efficiency and minimize loss	SCOTTZYME® SPECTRUM, SCOTTZYME® PEC5L, SCOTTZYME® HC

Cleaning

Fruit Wines & Mead

Crossflow Cleaning	All	Increase filtration throughput and filtration efficiency	SCOTTZYME® SPECTRUM
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General Tools

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LALLZYME CUVÉE BLANC

Skin contact enzyme for early and continual aroma release in whites

#16203	100 g	\$39.30
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LALLZYME CUVÉE BLANC™ is added to white grapes pre-pressing for increased aroma release from grapes and wine. This specialized enzyme is a blend of pectinase with β-glycosidase side-activities but low macerating abilities. In the juice phase, enzyme activity allows for the release of aroma compounds while gently extracting juice (even at low pressure), and fast settling. At the onset of fermentation, β-glycosidase activity will be inhibited due to the high glucose concentration (>5%), however as fermentation continues this inhibition is removed allowing the enzyme to release more aroma compounds. This granular enzyme from Lallemand Oenology allows for easier processing, increased aromas, flavors, and complexity.

Usage: Dissolve LALLZYME CUVÉE 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.

Storage: Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

Recommended Dosage

Crushed Grapes	Juice	Wine
20 g/ton	Not recommended	Not recommended

Stage of Winemaking: White Grapes	Activity: Pectinase and glycosidase	Impact: Enhanced aromatics
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LALLZYME EX

Increased fruity aromas, mouthfeel and color stability in reds

#16204	100 g	\$26.20
#16205	250 g	\$51.40

LALLZYME EX™ is a granular enzyme with pectinase, cellulase and hemicellulase activities to improve color stability and mouthfeel in red wines. Specific side activities contribute to the macerating action on the grape cell wall which allows progressive liberation of polyphenols and tannin bound-poly-saccharides. LALLZYME EX increases juice extraction, improves wine filterability and provides gentle maceration, even in when phenolic maturity has not been reached.

to grapes at the beginning of fermentation or start of cold soak.

Storage: Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

Recommended Dosage

Crushed Grapes	Juice	Wine
15-30 g/ton	Not recommended	Not recommended

Usage: Dissolve LALLZYME EX in 10 times its weight of water, gently stir and allow to sit for a few minutes. Add directly

Stage of Winemaking: Red Grapes	Activity: Pectinase, Cellulase, Hemicellulase	Impact: Gentle extraction of juice, aromas, and color
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LALLZYME EX-V

Increased aroma complexity, color stability, mouthfeel and tannin structure in reds

#16206	100 g	\$39.30
#16208	500 g	\$110.90

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.

grapes at the beginning of fermentation or the onset of cold soak.

Storage: Dated expiration. Store dry enzyme at 25°C(77°F). Once rehydrated, use within a few hours.

Recommended Dosage

Crushed Grapes	Juice	Wine
10-20 g/ton	Not recommended	Not recommended

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

Stage of Winemaking: Red Grapes	Activity: Pectinase, Cellulase, Hemicellulase	Impact: Enhanced structure, color, and complexity
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LALLZYME MMX LALLEMAND

Increased sweetness, roundness, and filterability of white and red wines

LALLZYME MMX™ is a granular enzyme with beta-glucanase and pectinase activities sourced from *Trichoderma harzianum* and *Aspergillus niger*. This enzyme improves yeast autolysis when wine is aged on yeast lees, leading to rounder, fuller-bodied wines. Glucanase and pectinase activities act synergistically to improve clarity and filterability of wines infected with *Botrytis*. In order to maximize benefit of LALLZYME MMX, a contact time of 6-8 weeks is recommended.

Beta-glucanase enzymes from *Trichoderma harzianum* are listed in 27 CFR 24.250.

#16207 | 100 g | \$50.40

Usage: Dissolve LALLZYME MMX in 10 times its weight of water, gently stir, allow to sit for a few minutes then add to wine.

Storage: Dated expiration. Store dry enzyme at 25°C (77°F). Once rehydrated use within a few hours.

Recommended Dosage *Bench trials recommended for wine*

Crushed Grapes	Juice	Wine
Not recommended	Not recommended	1-3 g/hL 40-114 g/1000 gal

Stage of Winemaking: Wine	Activity: Pectinase and beta-glucanase	Impact: Mouthfeel, clarification and filterability
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RAPIDASE CLEAR EXTREME RAPIDASE

Superior juice clarification under difficult conditions

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 lees and speed up clarification even in difficult conditions (low temperature, low pH, hard to settle varieties). 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

#16257 | 100g | \$24.20

add to the juice right after pressing.

Storage: Dated expiration. Store refrigerated at 4-8°C (39-45°F). Once rehydrated, use within a few hours.

Recommended Dosage

Crushed Grapes	Juice	Wine
Not recommended	1-4 g/hL 38-152 g/1000 gal	Not recommended

Stage of Winemaking: Juice Settling	Activity: Pectinase	Impact: Clarification under extreme conditions
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ARTICLE

OPTIMAL CONDITIONS FOR ENZYME ACTIVITY

Grape enzymes are generally inactive in the juice, must and wine environment. However, fungal-derived enological enzymes are not, and they work well under most winemaking conditions. Used from grape processing to pre-bottling, enzymes play a pivotal role in winemaking where they optimize aromas, color and mouthfeel, increase yield and quality of free run juice, and assist with processes like clarification and filtration.

However, there are certain factors that have an adverse impact on the activity of the enzyme. One key parameter is temperature. The lower the temperature, the lower the activity of the enzyme. At temperatures <50 °F/10°C enzymes will still work, but slowly. In cases of high temperature, more than 140°F/60°C, the enzyme can be destroyed. The ideal temperature for enzymes to work in winemaking is 50-86°F (10-30°C). The other key parameters to consider are time and dosage. The longer the enzyme is left to work, the more work it can do. Unfortunately, due to processing demands, time is often the limiting factor. The dosage required varies depending on contact time, grape varietal and ripeness, and the stage of winemaking. When using enzymes ensure that the presence of other enological products, processes or conditions do not stop the enzyme from working. Examples of products include high sulfur dioxide concentrations, bentonite or excessive enological tannin additions. These will immediately halt all enological enzyme activity. Time your SO₂, tannin and bentonite additions carefully and never mix enzymes directly with any of these additives. To completely stop all enzyme activity make a bentonite addition of 5-10 g/hL. Lastly, fungal derived β-glycosidase enzymes (e.g., SCOTTZYME® BG and RAPIDASE® REVELATION AROMA) which release aroma compounds from sugars, are inhibited by glucose (not fructose) concentrations >5%. Once the glucose concentration is less than 5% this inhibition is removed. Interestingly, yeast-produced β-glycosidase are not inhibited by glucose concentration.

To ensure your chosen enzymes are working to your advantage pay attention to temperature, dosage, potential inhibitory factors and the winemaking stage.

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RAPIDASE EXPRESSION AROMA

RAPIDASE

Skin contact enzyme for aroma release from thick skinned grapes

#16260

100g

\$25.20

RAPIDASE® EXPRESSION AROMA is a granular enzyme specifically formulated for early extraction of aroma precursors from white grapes optimizing aromatic compounds and complexity of the final wine. It is particularly useful for thick skin or early harvested grapes.

Usage: 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.

Storage: Dated expiration. Store refrigerated at 5-15°C (41-59°F). Once rehydrated, use within a few hours.

Recommended Dosage

Crushed Fruit	Juice	Wine
20-25 g/ton	Not recommended	Not recommended

Stage of Winemaking: White grapes	Activity: Pectinase	Impact: Varietal optimization
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RAPIDASE REVELATION AROMA

RAPIDASE

Increased release of tropical, fruity and floral aromas

#16266

100g

\$51.40

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 terpenes for intense and complex aromas. Since glycosidase activity is inhibited by glucose levels above 5% glucose a REVELATION AROMA addition after fermentation can be beneficial. Once the desired aroma has been obtained, enzyme action can be stopped via a (5-10g/hL) bentonite addition.

Usage: Dissolve RAPIDASE REVELATION AROMA in 10 times its weight of water, stir gently, allow to 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. Enzyme can be deactivated with a 5-10 g/hL bentonite treatment.

Storage: Dated expiration. Store refrigerated at 5-15°C (41-59°F). Once rehydrated, use within a few hours

Recommended Dosage *Bench trials recommended for wine*

Whites		
Crushed Fruit	Juice	Wine
15-22 g/ton	1-1.5 g/hL 35-55 g/1000 gal	1-2 g/hL 35-70 g/1000 gal
Reds		
Crushed Fruit	Juice	Wine
20-25 g/ton	2-2.5 g/hL 70-90 g/1000 gal	2-2.5 g/hL 70-90 g/1000 gal

Stage of Winemaking: Red or white grapes, juice or wine	Activity: Pectinase and glycosidase	Impact: Aroma release
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SCOTTZYME BG

Post-fermentation enzyme to increase aromas and flavors

#16176

1 kg

\$206.70

SCOTTZYME® BG 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. BG should only be used 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 5% glucose remaining for proper enzyme activity. Once the desired aroma has been obtained, enzyme action can be halted via a (5-10g/hL) bentonite addition.

Usage: Dissolve SCOTTZYME BG in 10 times its weight of cool water, stir gently, allow to sit for a few minutes and add to

wine. Enzyme can be deactivated with a 5-10 g/hL bentonite treatment.

Storage: Store at room temperature for 1-2 years. Once opened, keep tightly sealed and dry. Once rehydrated, use within a few hours.

Recommended Dosage *Bench trials recommended for wine*

Crushed Grapes	Juice	Wine
Not recommended	Not recommended	3-5 g/hL 114-190 g/1000 gal

Stage of Winemaking: Wine	Activity: Pectinase and beta-glucosidase	Impact: Aroma release
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SCOTTZYME CINN-FREE

All-purpose enzyme for white and rosé juice

SCOTTZYME® 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, CINN-FREE aids in pressability, yield, settling, clarification and filtration. It is recommended for aromatic varieties like Sauvignon blanc, Viognier, Pinot gris, Gewürztraminer, Riesling and Vignoles. It can also be used in varieties like Chardonnay to bring out the full aromatic potential of the grape.

Usage: Dilute SCOTTZYME CINN-FREE to approximately a

Stage of Winemaking: White grapes or juice	Activity: Pectinase	Impact: Aroma and clarification
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SCOTTZYME COLOR PRO

Increased roundness and color stability and reduced “veggie” character in red wine

SCOTTZYME® COLOR PRO is a specialty liquid pectinase with protease side-activities. These side-activities are important for helping break down cell walls of red grapes to gently extract anthocyanins, phenolic compounds and tannins. This gentle extraction creates wines that are rounder in the mouth, bigger in structure, and with improved color stability. Wines made with COLOR PRO tend to have increased tannins, improved clarity and reduced herbaceous or veggie characters. Lower doses of COLOR PRO are recommended for red varieties that are underripe, low in anthocyanins or high in seed tannins. For big reds from ripe fruit with mature seeds, higher doses of COLOR PRO are recommended.

Stage of Winemaking: Grapes, juice and wine	Activity: Pectinase and protease	Impact: Rounder, bigger wines with increased color
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SCOTTZYME HC

For fruit and American grapes to increase yield, clarity and filterability

SCOTTZYME® HC is a liquid pectinase and cellulase blend developed to increase yield, reduce solids and improve filtration. It is a strong enzyme useful for hard-to-press or slimy grapes (such as Concord), pome fruit (apple or pear), and stone (pitted) fruits. HC is best used in conjunction with SCOTTZYME® PECSL.

Usage: Dilute SCOTTZYME HC to approximately a 10% solution in cool water. Pour the solution over the crushed fruit or add during a tank mixing before alcoholic fermentation. If adding to wine, gently mix a 10% solution into the tank for even dispersion.

Stage of Winemaking: Grapes and Fruit	Activity: Pectinase and cellulase	Impact: Clarification and filtration
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#16175	1 kg (890 mL)	\$95.20
#16165	25 kg (22.25 L)	\$1344.30

10% solution in cool water. Pour over the grapes before pressing or add to juice before the start of alcoholic fermentation.

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Recommended Dosage

Crushed Grapes	Juice	Wine
15–30 mL/ton	1.3–1.6 mL/hL 50–60 mL/1000 gal	Not recommended

#16172	1 kg (890 mL)	\$81.90
#16162	25 kg (22.25 L)	\$1039.40

Usage: Dilute SCOTTZYME 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.

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Recommended Dosage

Reds		
Crushed Grapes	Juice	Wine
60–100 mL/ton	Best used before fermentation	Best used before fermentation

#16171	1 kg (890 mL)	\$81.90
#16161	25 kg (22.25 L)	\$1039.40

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Recommended Dosage *Bench trials recommended for wine*

Crushed Fruit	Juice	Wine
60–100 mL/ton	5.3–7.9 mL/hL 200–300 mL/ 1000 gal	6.6–9.2 mL/hL 250–350 mL/ 1000 gal

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SCOTTZYME KS

Improved settling and filterability in grape juice and wine

SCOTTZYME® KS is a liquid blend of enzymes developed to create a special formulation for difficult-to-settle or hard-to-filter juice or wine. The earlier in the process KS is used, the more effective it will be. However, it should never be used before pressing in either red or white grapes. It is never too late to use KS. Customers have reported very favorable results when used to solve “nightmare” filtrations before bottling.

Usage: Dilute SCOTTZYME KS to approximately a 10% solution in cool water. Add to the juice after pressing or to the wine after alcoholic fermentation during a tank mixing.

Warning: Never use Scottzyme KS before pressing. KS has very aggressive enzymatic activities that will break down skins and create too many fine solids. After pressing, these activities will help with settling and the breakdown of sticky sol-

#16174	1 kg (890 mL)	\$81.90
#16164	25 kg (22.25 L)	\$1039.40

ids (even from *Botrytis*). The goal is to make the juice or wine more manageable.

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Recommended Dosage *Bench trials recommended for wine*

Reds		Whites	
Crushed Grapes	Must	Juice	Wine
Not recommended	Not recommended	2.6–4.0 mL/hL	5.3–7.9 mL/hL
		100–150 mL/1000 gal	200–300 mL/1000 gal

Stage of Winemaking: Juice or wine	Activity: Pectinase, cellulase and protease	Impact: Clarification and filtration
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SCOTTZYME SPECTRUM

Concentrated formulation for fast throughput, improved filtration efficiency and crossflow cleaning

SCOTTZYME® SPECTRUM is a powerful liquid enzyme created for use in wine that is very difficult to clarify. It has higher enzyme activities for the most difficult tasks. SPECTRUM should be used on finished wine only, either to assist with settling or to help with filtration issues before bottling.

Usage: Dilute SCOTTZYME SPECTRUM to approximately a 10% solution in cool water. Add to the wine after alcoholic fermentation during a tank mixing.

Warning: Never use SCOTTZYME SPECTRUM before pressing or on the juice. It is our most aggressive enzyme and may result in over clarification of juice.

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

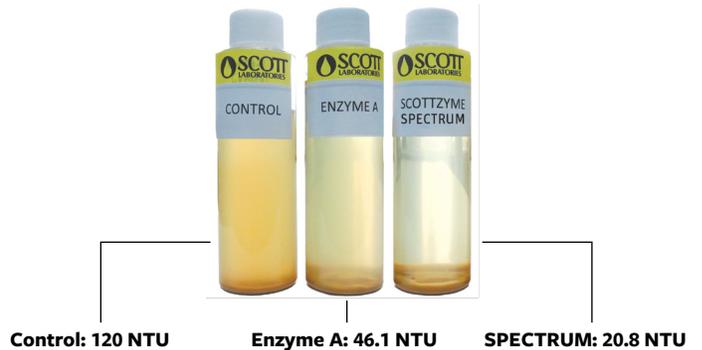
Recommended Dosage *Bench trials recommended*

Fruit	Juice	Wine
Not recommended	Not recommended	4 mL/hL
		150 mL/1000 gal

Stage of Winemaking: Wine	Activity: Pectinase, cellulase and protease	Impact: Clarification and filterability in very difficult lots
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#16177	1 kg (890 mL)	\$120.80
#16167	25 kg (22.25 L)	\$1680.80

Impact of SCOTTZYME SPECTRUM on Turbidity after Four Day Settling at Room Temperature



SCOTTZYME PEC5L

Improve pressability, clarification and settling for white and fruit wines

SCOTTZYME® PEC5L is a highly concentrated liquid pectinase blend developed and formulated specifically for winemaking.

It is used on crushed grapes for easier pressing and higher yields and in juice for improved settling, clarification and filtration. It is also useful for berries, pome and stone fruits. When adding to fruit, it is beneficial to use in conjunction with SCOTTZYME HC.

Usage: Dilute SCOTTZYME PEC5L to approximately a 10% so-

#16170	1 kg (890 mL)	\$81.90
#16160	25 kg (22.25 L)	\$915.60

lution in cool water. Pour over the grapes or fruit before pressing or add to the juice before the start of alcoholic fermentation.

Storage: Store at 4°C(39°F) for 1–2 years. Keep tightly sealed and refrigerated once opened.

Recommended Dosage *Bench trials recommended for wine*

Crushed Grapes	Juice	Wine
10–20 mL/ton	1.0–1.3 mL/hL	1.3–1.6 mL/hL
	40–50 mL/1000 gal	50–60 mL/1000 gal

Stage of Winemaking: White grapes and fruit, juice and wine	Activity: Pectinase	Impact: Clarification
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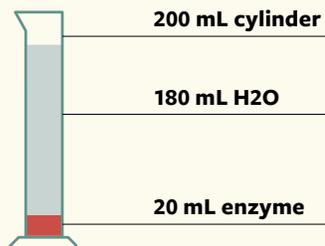
FREQUENTLY ASKED QUESTIONS: ENZYMES

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/fruit 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.

HOW TO

HOW TO MAKE A 10% SOLUTION



If using a dose of 20 mL/ton on one ton of grapes, mix 20mL of liquid enzyme with approximately 180 mL of water.

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 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 mg/L of SO₂.

Are enzymes deactivated by SO₂?

Yes, enzymes are inhibited by SO₂. Deactivation occurs around 500 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. Anthocyanins are water-soluble and are released as the grapes are crushed. Most of a red wine's color potential is achieved very early.

Why are you no longer recommending SCOTTZYME® COLOR PRO on whites?

SCOTTZYME COLOR PRO is still fine to use on whites, however we have other enzymes that are more appropriate for white wine processing.

When should I choose LALLZYME EX™ or LALLZYME EX-V™?

LALLZYME EX is recommended for fruit forward red wines and EX-V is for highly-structured reds.

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?

It is best to add SCOTTZYME® KS after 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 KS to the juice tank. Preventative use is more effective and quicker.

Warning: Do not use SCOTTZYME® KS before pressing. Never use SCOTTZYME® KS on 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 Botrytis 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 24.250.

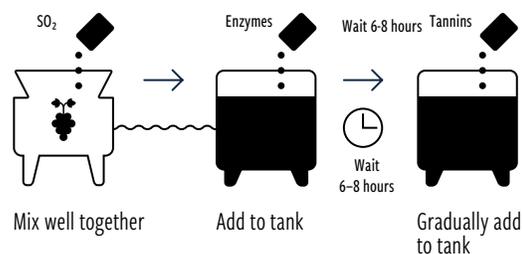
How long should I leave the enzyme on white grapes before pressing?

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 at the same time. It is okay to add enzymes after the SO₂ is adequately dispersed 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.

Timing of Additions: SO₂, Enzymes and Tannins



Add SO₂ and mix well prior to adding enzymes. Tannins can be added 6–8 hours later. Yeast derivative nutrients (e.g. OPTI-RED) can be added at any point during fermentation.



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 early can avoid compounded problems later.

BROWNING & OXIDATION	CLARIFICATION	HAZE	TARTRATE INSTABILITY	SENSORY ASPECTS
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 PVPP/Casein based products can help remove oxidized phenolics and brown pigments in both the juice and wine phase.	High solids can be problematic. Solids removal can be achieved using enzymes, gelatins, 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 can be caused by many things: microbes, heat unstable proteins, tartrates, residual fining aids, etc. Protein instability can be remedied by using bentonite and residual fining aids can be removed by Cristalline Plus and silica gels like Gelocolle. Microbial hazes can be reduced via fining and filtration. Microbial stability can also be achieved through appropriate use of microbial control agents (see pgs 107-111).	Preventing tartrate precipitation in a finished wine can be achieved in a number of ways. Traditionally, tanks 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 gum arabic. These products work by inhibiting tartrate crystal formation, thereby keeping tartrates in solution.	Wines with perceived astringency and bitterness may be improved with the use of gelatins or other protein-based products that complex with polyphenols. When the goal is to improve aromatic profiles, products like isinglass (pg 103), tannins (pgs 74-79) as well as gelatins (pg 103) are useful.

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

Fining/stability agent preparation	Dosage	Contact time	Shape and size of vessel	Temperature	Winemaking stage	Previous treatments	Addition method
Most dry agents should be prepared in water. Always read product directions and follow accordingly.	Bench trials must be conducted on each wine to determine proper dose rate.	Most agents react rapidly when contact is made, but may need time to settle out.	Vessel type may impact settling time.	Temperature impacts settling time. Both high and low temperatures can inhibit sedimentation.	Ensure the treatment is compatible with wine-making stage.	Previous treatments can interfere with downstream treatments.	Pumping using a Venturi is an efficient way to disperse agents. Closed circulation after addition is also beneficial.

CHOOSING FINING & STABILITY AGENTS

WINEMAKING STAGE	WINE TYPE	WINEMAKING GOAL	RECOMMENDED PRODUCTS
On Incoming Grapes and in Press	White, Rosé	Counteract moldy aromas	FRESHPROTECT, GRANUCOL GE
	White, Rosé	Oxidation prevention and treatment	FRESHPROTECT, GRANUCOL FA, NO[OX]
	White, Rosé	Remove unwanted color	GRANUCOL FA
Juice	White, Rosé	Counteract moldy aromas	BENTOLACT S, CASÉINATE DE POTASSIUM, GRANUCOL GE, NO[OX], POLYCACEL
	White, Rosé	Oxidation prevention	FRESHPROTECT, POLYCACEL
	White, Rosé	Oxidation treatment, diminish bitterness	BENTOLACT S, CASÉINATE DE POTASSIUM, FRESHPROTECT, NO[OX], POLYCACEL
	White, Rosé	Remove unwanted color	GRANUCOL FA
	White, Rosé	Clarification	BENTOLACT S, NACALIT® PORE-TEC, QI'UP XC
	White, Rosé	Remove potential haze forming proteins and compact lees	GRANUBENT PORE-TEC, NACALIT® PORE-TEC
	White, Rosé	Reduce sulfur off odors	BENTOLACT S, REDULESS™
Flotation	White, Rosé	Aids flotation	GRANUBENT PORE-TEC, INOCOLLE WITH GELOCOLLE, NACALIT® PORE-TEC, QI'UP XC
Fermentation	White, Rosé	Remove color	POLYCEL
	Aromatic White, Rosé	Remove haze forming proteins	FERMOBENT® PORE-TEC
	Red, White, Rosé	Reduce sulfur defects	BENTOLACT S, REDULESS™
Post-Fermentation	Red, White, Rosé	Counteract unwanted aromas	NO[OX], GRANUCOL GE, BENTOLACT S
	Red, White, Rosé	Oxidation prevention	POLYCACEL, POLYCEL, PURE LEES LONGEVITY +™
	Red, White, Rosé	Oxidation treatment	NO[OX], CASÉINATE DE POTASSIUM, FRESHPROTECT, GRANUCOL FA, POLYCACEL
	Red, White, Rosé	Remove unwanted color	GRANUCOL FA, FRESHPROTECT, POLYCEL
	Red, White, Rosé	Diminish bitterness	BENTOLACT S, CASÉINATE DE POTASSIUM, FRESHPROTECT, NO[OX], POLYCACEL, POLYCEL
	Red, White, Rosé	Clarification	CRISTALLINE PLUS, INOCOLLE, NACALIT® PORE-TEC, QI'UP XC
	Red, White, Rosé	Help compact lees	GELOCOLLE, NACALIT® PORE-TEC
	Red, White, Rosé	Remove haze forming proteins	BLANCOBENT UF(CROSSFLOW), GRANUBENT PORE-TEC
	Red, White, Rosé	Protects against over-fining	GELOCOLLE
	Red, Hard-Press White, Rosé	Diminish harsh & astringent tannins, minimize greenness	COLLE PERLE, FRESHPROTECT
	Red, White, Rosé	Unmask aromas	INOCOLLE, CASÉINATE DE POTASSIUM, POLYCACEL
	Red, White, Rosé	Reduce sulfur defects	REDULESS™, BENTOLACT S
Immediately Prior to Bottling	Red, White, Rosé	Promote potassium bitartrate stability	CLARISTAR®, ULTIMA SOFT
	Red, White, Rosé	Stabilize colloids/ prevent deposits in the bottle	FLASHGUM R LIQUIDE, ULTIMA SOFT, CLARISTAR®
	Red, White, Rosé	Minimize tannin sensations of bitterness, harshness or astringency	ULTIMA SOFT
	Red, White, Rosé	Increase roundness and perception of sweetness	CLARISTAR®, FLASHGUM R LIQUIDE, ULTIMA SOFT

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ACTIVATED CARBON

GRANUCOL FA

Decolorizing carbon

Red, White, Rosé

#15331	1 kg	\$21.20
#15334	10kg	\$198.00

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.

Usage: Add GRANUCOL FA directly to juice or wine. The pellets immediately dissolve after addition. Stir vigorously for several minutes to ensure even distribution. The activated carbon deposit should be racked as soon as possible.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice		
100–1000 ppm	10–100 g/hL	0.83–8.3 lb/1000 gal
Wine		
100–300 ppm	10–30 g/hL	0.83–2.5 lb/1000 gal

Stage of Winemaking: Juice, Wine	Contact Time: 24 hours	Impact: Removes color
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GRANUCOL GE

Deodorizing carbon

Red, White, Rosé

#15332	1 kg	\$21.20
#15333	10kg	\$198.00

GRANUCOL® GE is a deodorizing carbon for the absorption of off-tastes and off-aromas. It is especially useful in removing moldy aromas from grapes contaminated with rot. These activated carbon pellets are prepared for ease of use in the cellar.

Usage: Add GRANUCOL GE directly to juice or wine. The pellets immediately dissolve after addition. Stir vigorously for several minutes to ensure even distribution. The activated carbon deposit should be racked as soon as possible.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice		
100–1000 ppm	10–100 g/hL	0.83–8.3 lb/1000 gal
Wine		
100–600 ppm	10–60 g/hL	0.83–5.0 lb/1000 gal

Stage of Winemaking: Juice, Wine	Contact Time: 24 hours	Impact: Removes off-odors and flavors
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BENTONITE

Bentonite is aluminum silicate clay which is mined in several areas around the world. The wine industry uses two types of bentonite, sodium (Na) and calcium (Ca), to remove heat unstable protein from wines. Sodium-based bentonites are better at protein removal. Its lattice structure readily separates in water, exposing negative charges that quickly adsorb and trap positively charged proteins. 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 a sodium-based bentonite is recommended.

Calcium bentonite is gentler. Its structure does not separate as easily in water, it flocculates faster, and forms a more compact sediment.

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, isinglass, 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 bentonites in the world.

Note for successful bentonite preparation: The temperature of the water used to swell Erbslöh bentonite is not important, however, the quality of the water is. 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. Prior to using stored bentonite, ensure that it has not picked up any off-odors.

BLANCOBENT UF

Bentonite for use during crossflow filtration

Red, White, Rosé

#15320

25 kg

\$130.00

BLANCOBENT UF is a highly purified and particularly effective powdered bentonite for protein removal. It was 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 protein stabilization happen in one step!

Usage: Add BLANCOBENT UF slowly to approximately 10 times its weight of water under constant stirring. Allow a rest period of 30–60 minutes, then stir again thoroughly. Let the mixture swell for 6–12 hours. Dispose of supernatant and add remaining bentonite slurry to the wine while thoroughly mixing.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Wine

200–2000 ppm	20–200 g/hL	1.6–16.8 lb/1000 gal
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BLANCOBENT UF has fine particles and is free of crossflow-damaging grit and sand.



Competitor Bentonite.

Stage of Winemaking: Pre-crossflow filtration (wine)

Contact Time: 1 hour

Impact: Removes proteins

Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
Cleaning
Fruit Wines & Mead
General Tools
Index

FERMOBENT PORE-TEC

Bentonite for use during fermentation

White, Rosé

FERMOBENT® PORE-TEC is a pure granular sodium-calcium based bentonite with low iron for the specific treatment of juice. Due to its low iron content, fermenting on FERMOBENT is possible and encouraged. Fermenting on bentonite improves the release of CO₂ during fermentation and the constant contact between fermenting juice and bentonite may eliminate the need for protein stabilization before bottling. This also helps to preserve varietal aromatics as protein fining takes place before volatile aromatics are produced.

Usage: Add FERMOBENT PORE-TEC slowly to approximately 5 times its weight of water and allow to swell. Allow a rest

#15321	5 kg	\$42.00
#15323	20kg	\$140.00

period of 4–6 hours. Dispose of supernatant and add remaining bentonite slurry to the must while thoroughly mixing. After fermentation, rack off bentonite and gross lees.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

1000–2000ppm	100–200 g/hL	8.4–16.8 lb/1000 gal
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Stage of Winemaking: Fermentation	Contact Time: During fermentation	Impact: Removes proteins
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GRANUBENT PORE-TEC

Bentonite for general protein stability

Red, White, Rosé

GRANUBENT 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-TECnology, making it almost dust-free and easy to use.

#15325	20 kg	\$112.00
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Usage: Add GRANUBENT PORE-TEC slowly to approximately 10 times its weight of water under constant stirring. Let the mixture swell for 4–8 hours. Dispose of supernatant and add remaining bentonite slurry to the wine while thoroughly mixing.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

350–750 ppm	35–75 g/hL	2.9–6.3 lb/1000 gal
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Wine

200–1500 ppm	20–150 g/hL	1.7–12.6 lb/1000 gal
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GRANUBENT PORE-TEC is cleaner and more uniform than other bentonites.

Competitor Bentonite.

Stage of Winemaking: Juice or wine	Contact Time: 1-7 days	Impact: Removes proteins
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NACALIT PORE-TEC

Sodium-calcium bentonite for clarification

Red, White, Rosé

NACALIT® PORE-TEC is a granulated sodium-calcium bentonite that is specifically formulated for instances where superior flocculation, adsorption and clarification are required.

Usage: Add NACALIT PORE-TEC slowly to approximately 5-10 times its weight of water under constant stirring. Allow to swell for a minimum of 4–12 hours. Dispose of supernatant and add remaining bentonite slurry to the wine while thoroughly mixing.

#15322	5 kg	\$48.00
#15324	20kg	\$145.00

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

50–1500 ppm	50–150 g/hL	4.2–12.6 lb/1000 gal
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Stage of Winemaking: Cold settling for juice, protein stabilization for wine	Contact Time: 1-7 days	Impact: Clarification and protein removal
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CASEIN and/or PVPP

BENTOLACT S

For the preventative treatment of oxidation and removal of off-odors
White, Rosé, Fruit Wine

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.

Usage: Suspend BENTOLACT S in approximately 10 times its weight in cold water and mix vigorously to remove lumps. Mix well and allow the mixture to stand for 3 hours. Add during a pump-over or a good mixing. BENTOLACT S additions may take up to 7 days to settle.

Once hydrated, BENTOLACT S should not be stored for more than 24 hours.

#15788 | 5 kg | \$131.00

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

200-1000 ppm	20-100 g/hL	1.7-8.4 lb/1000 gal
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Wine

1000-2000 ppm	100-200 g/hL	8.4-16.8 lb/1000 gal
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Stage of Winemaking: Cold settling for juice, pre-bentonite add for wine

Contact Time: 1-2 weeks

Impact: Cleans up off odors and flavors. Preventative treatment for oxidation

CASÉINATE DE POTASSIUM

To help prevent oxidation and remove oxidized components
White, Rosé, Fruit Wine, Cider

CASÉINATE DE POTASSIUM is used in both juice and wine for the treatment of oxidized phenolics and bitter compounds. It helps freshen wine and reveal muted aromas. Although the potassium helps with solubility, once added a thorough mixing is essential.

Usage: Suspend CASÉINATE DE POTASSIUM in approximately 10 times its weight of cold water. Mix well and allow the solution to stand for 4 hours. Stir to remove lumps. For juice, add before settling or at the start of alcoholic fermentation. For wine, mix vigorously after adding as CASÉINATE DE POTASSIUM can float.

Once hydrated, CASÉINATE DE POTASSIUM should be used within 48 hours.

#15808 | 5 kg | \$256.00

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

500-1000 ppm	50-100 g/hL	4.2-8.4 lb/1000 gal
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Wine

200-1000 ppm	20-100 g/hL	1.7-8.4 lb/1000 gal
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Stage of Winemaking: Pre-fermentation for juice, pre-bentonite add for wine

Contact Time: 1-2 weeks

Impact: Treats oxidation

FRESHPROTECT

For treatment of oxygen sensitive juice and wine
White, Rosé, Fruit Wine

FRESHPROTECT is a proprietary IOC blend of polyvinylpyrrolidone (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.

Usage: Suspend FRESHPROTECT in approximately 10 times its weight of cool water. Mix well and allow to sit for 1 hour.

#15791 | 5 kg | \$150.20

Add the mixture into the tank slowly; making sure the solution is thoroughly mixed.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

200-1000 ppm	20-100 g/hL	1.7-8.3 lb/1000 gal
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Stage of Winemaking: Juice: Cold settling, young wines

Contact Time: 1-2 weeks

Impact: Softens wine and removes oxidized characters

Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stability
Microbial Control
Cleaning
Fruit Wines & Mead
General Tools
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POLYCACEL

For treatment of oxidized must and wine or for the preventative treatment of browning and pinking

White, Rosé, Fruit Wine

POLYCACEL is an IOC blend of polyvinylpyrrolidone (PVPP), micropulverized cellulose and casein for use on phenols associated with browning and pinking. It can reduce bitterness and reveal hidden aromas. POLYCACEL must be removed from wine via filtration per TTB regulations due to the PVPP.

Usage: Suspend POLYCACEL in approximately 20 times its weight in 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.

#15785	1 kg	\$89.70
#15786	5 kg	\$268.00

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

300-700 ppm	30-70 g/hL	2.5-5.8 lb/1000 gal
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Wine

150-300 ppm	15-30 g/hL	1.25-2.5 lb/1000 gal
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Stage of Winemaking: Cold settling for juice, pre-bentonite addition for wine	Contact Time: 10-21 days	Impact: Treatment of oxidation, unmasking of aromas
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POLYCEL

For treatment of pinking or browning, removal of bitter compounds

White, Rosé

POLYCEL is a blend of polyvinylpyrrolidone (PVPP) and cellulose formulated to help prevent and/or treat compounds which cause pinking and browning. 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.

Usage: Suspend 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.

#15784	1 kg	\$78.60
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Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

Juice

400-800 ppm	40-80 g/hL	3.3-6.7 lb/1000 gal
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Wine (Preventative)

150-300 ppm	15-30 g/hL	1.25-2.5 lb/1000 gal
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Wine (Curative)

300-500 ppm	30-50 g/hL	2.5-4.2 lb/1000 gal
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Stage of Winemaking: Cold settling for juice, young wines post early racking	Contact Time: 1-2 weeks	Impact: Oxidation control, removal of bitter compounds
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Chitosan is an exciting tool for winemakers. It is non-allergenic and non-animal based. It can be used to replace gelatin, casein, lysozyme and other animal-based winemaking products for juice and wine clarification and stabilization.

Chitosan, derived from the deacetylation of chitin, is the second most abundant polysaccharide on earth after cellulose, and is naturally produced by many living organisms. Per the TTB regulations Chitosan used in winemaking must be derived from the fungus *Aspergillus niger*.

Chitosan is a diverse molecule, and depending on the preparation, it can vary in degree of deacetylation, ionic charge, molecular weight and solubility. By changing one or more of these properties, the functionality of the chitosan molecule changes. This means that chitosan is not limited to a single application.

In winemaking, chitosan can be used as an antimicrobial, antioxidant or clarification agent.

ANTIMICROBIAL AGENT

For optimized anti-microbial activity, ionic charge, molecular weight and solubility are important. An optimized formulation leads to intense electrostatic interactions between chitosan and negatively charged components on yeast and bacteria cell walls. Ultimately the cell membrane is damaged, leading to an osmotic and energy imbalance, loss of growth capacity and eventually cell death. **NO BRETT INSIDE™** and **BACTILESS™** are chitosan-based and can be used instead of lysozyme and/or SO₂ to control *Brettanomyces* spp., lactic acid bacteria and acetic acid bacteria.

ANTIOXIDATION AGENT

Chitosan effectively blocks the formation of free radicals via direct scavenging or via indirect means through metal ion (Iron and Copper) chelation. This means that the oxidation cascade is blocked, so browning is minimized. Chitosan is also thought to inhibit browning due to absorption of oxidized phenolic compounds or by coagulation of suspended solids to which polyphenol oxidases are bound. **NO[OX]** is an effective antioxidant as it has a high degree of deacetylation and high molecular weight.

CLARIFICATION AGENT

For clarification, the degree of deacetylation is important. The higher the deacetylation rate the stronger the charge of the molecule. When chitosan is used for clarification then a highly charged molecule is essential. The addition of tartaric acid to **QI-UP XC** allows chitosan to carry an even higher charge which promotes flocculation and destabilizes colloids, therefore increasing clarification rates.

Although chitosan can be used in many roles, the different chitosan-based products (**NO BRETT INSIDE™**, **BACTILESS™**, **QI-UP XC** and **NO[OX]**) are not interchangeable as they may have different molecular weights, ionic charge and solubility. This is a very exciting time as we seek to bring more products to market that allow for clean-crafted beverages. Although chitosan products have anti-microbial and anti-oxidation roles, and can help lower SO₂ use, the individual products are not replacements.

At this point Chitosan is listed on 27 CFR 24.250 to remove spoilage organisms such as *Brettanomyces* from wine. The petitions to allow the use of chitosan as a fining agent are ongoing. The most up to date information can be found on the individual product pages at scottlab.com.

CHITOSAN

NEW

NO[OX] 

To remove oxidized characters in juice and wine

White, Rosé

NO[OX] can be used in juice or wine to remove oxidized compounds. NO[OX] is an innovative and highly specialized chitosan-bentonite based fining aid from the IOC that can be used at any time during the winemaking process. NO[OX] can be used during juice settling to clean-up mold damaged or herbaceous fruit, and if needed it can be used during fermentation. In sensory trials NO[OX] was found to be superior to SO₂, and other casein alternatives at removing oxidized characteristics including color, aromas and flavors. This fining agent can remove herbaceous and bitter notes, and increase freshness resulting in significant quality improvements. By blending the chitosan with bentonite, lees are compacted and wine loss is minimized. Although new to the Scott Labs portfolio, NO[OX] has been successfully used in other countries since 2010.

This animal-free, non-allergenic fining agent is a viable alternative to casein.

Stage of Winemaking: Any: pre-fermentation, during fermentation or post-fermentation

Contact Time: Juice 16 hours minimum. Wine 1-2 weeks

Impact: Removes oxidized characters, freshens aromas, reduces herbaceousness and bitterness

#16421

5 kg

\$235.00

Usage: Slowly add NO[OX] in 10 times its weight of clean, chlorine-free water, mixing constantly until suspension is homogeneous. There must be no lumps in the suspension. Depending on amount of NO[OX] to rehydrate this can take up to one hour. NO[OX] is insoluble, so it is essential that solution is mixed during addition. Rack once lees are well settled.

Storage: Dated expiration. Store away from light and in a dry, odor-free environment below 25°C (77°F). Once opened, use immediately.

Recommended Dosage *Bench trials recommended*

Juice

300–800 ppm	30–80 g/hL	2.5–6.7 lb/1000 gal
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Wine

200–600 ppm	20–60 g/hL	1.67–5.0 lb/1000 gal
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NEW

QI'UP XC 

Superior clarification

White, Rosé

QI'UP XC is used in juice for superior clarification. This innovative floccing agent from the IOC was initially used during juice flotation but does equally well during traditional cold settling. QI'UP XC is a specialized preparation of chitosan, activated with tartaric acid, that has a high surface charge allowing it to bind to solid particles. When used during flotation these larger particles are carried to the top of the flotation vessel on micro-bubbles of nitrogen gas or air, resulting in a clean juice. For successful flotation, the juice must not have started fermenting, confirmed pectin-free (use 3-4mL/hL SCOTTZYME® PEC5L, and temperature >13°C(55°F)). To aid in lees/cap compaction during settling and flotation, Qi'UP XC should be used in conjunction with bentonite. We recommend 10-30g/hL of NACALIT® PORE-TEC.

This animal-free, non-allergenic fining agent is a viable alternative to gelatin for juice and wine clarification.

Stage of Winemaking: Clarification (juice or wine)

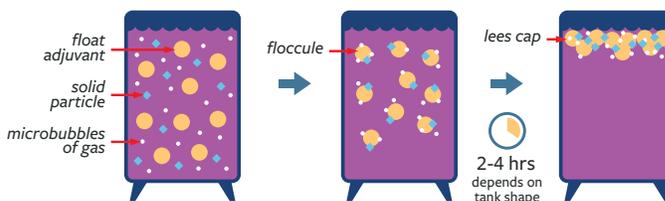
Contact Time: Until juice lees cap forms during flotation (2-4 hours depending on juice volume and conditions and size and shape of tank), or until target solids level reached during static settling

Impact: Superior clarification

#16430

1 kg

\$84.00



Usage: Add QI'UP XC in 10 times its weight of clean, chlorine-free water, mixing constantly until suspension is homogeneous. Stir to maintain suspension during addition.

Storage: Dated expiration. Store away from light and in a dry, odor-free environment below 25°C (77°F). Once opened, use immediately.

Recommended Dosage *Bench trials recommended*

30–100 ppm	3–10 g/hL	0.25–0.83 lb/1000 gal
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At this point Chitosan is listed on 27 CFR 24.250 to remove spoilage organisms such as *Brettanomyces* from wine. The petitions to allow the use of chitosan as a fining agent are ongoing. The most up to date information can be found on the individual product pages at scottlab.com.

GELATINS

COLLE PERLE

Gelatin for clarification and treatment of astringent wines

Red, White, Fruit Wines

COLLE PERLE is a hydrolyzed gelatin solution which can be used for clarification or softening bitter and astringent tannins. COLLE PERLE flocculates and settles well. It is particularly useful for young wines or hard pressed fractions.

Usage: 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 the first racking will produce the best results. It is not recommended to leave gelatins in wine for more than 30 days.

#15798	1 L	\$23.20
#15799	5 L	\$75.60
#15800	20 L	\$280.10

COLLE PERLE can be used in conjunction with GELOCOLLE to improve settling or prevent overfining (see pg 102 for directions).

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Once open use immediately.

Recommended Dosage <i>Bench trials recommended</i>		
800–1500 ppm	80–150 mL/hL	3.0–5.7 L/1000 gal

Stage of Winemaking: Post alcoholic fermentation but pre-bentonite addition	Contact Time: 1 week	Impact: Clarification, removal of bitter and astringent compounds
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INOCOLLE

Multi-purpose gelatin for use in juice and wine

Red, White, Rosé, Fruit Wines, Cider

INOCOLLE is a multi-purpose, partially hydrolyzed gelatin solution that can be used in red, white and rosé wines. In white and rosé wines it can be used for clarification resulting in improved brilliance and suppleness. In red wines, INOCOLLE can improve the aromas and flavors of finished wine, while removing both colloidal and unstable material. It is particularly useful for juice fining and flotation.

Usage: Juice

Dilute INOCOLLE 1:1 in water. Introduce into juice gradually while mixing vigorously to ensure even treatment. Racking should be done after 1 week.

Usage: Wine

Dilute INOCOLLE 1:1 in water. Introduce into wine gradually while mixing to ensure even treatment. Racking should

#15795	1 L	\$26.20
#15796	5 L	\$88.70

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.

INOCOLLE can be used in conjunction with GELOCOLLE to improve settling or prevent overfining (see pg xx for directions).

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage <i>Bench trials recommended</i>		
300–1000 ppm	30–100mL/hL	1.1–3.8 L/1000 gal

Stage of Winemaking: Cold settling for juice, pre-bentonite addition for wine	Contact Time: 1 week	Impact: Clarification and aroma revelation
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Let's Start
Vineyard
Yeast
Yeast Nutrients
Malolactic Fermentation
Oak & Tannins
Enzymes
Fining & Stabilify
Microbial Control
Cleaning
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INACTIVATED YEAST & BENTONITE BLENDS

PURE-LEES LONGEVITY +



Gentle fining and oxygen scavenging, compatible with no/low SO₂ winemaking
White, Rosé, Cider

#15249

1 kg

\$39.30

PURE-LEES LONGEVITY +™ is a proprietary blend of inactivated yeast and bentonite used to scavenge dissolved oxygen during aging, cold (tartrate) 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.

Usage: Suspend PURE-LEES LONGEVITY + in 10 times its weight of water, gently mix 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 packaging immediately.

Recommended Dosage *Bench trials recommended*

200–400 ppm	20–40 g/hL	1.7–3.4 lb/1000 gal
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Stage of Winemaking: Post-fermentation

Contact Time: 1-9 months

Impact: Scavenges oxygen

ARTICLE PURE-LEES LONGEVITY +: INACTIVATED YEAST TO SCAVENGE OXYGEN

Scavenging dissolved oxygen during aging and storage helps protect white and rosé wine quality from the end of fermentation through the bottling step. During aging or movement of finished wines, white and rosé wines can develop aroma defects due to oxidation reactions. These reactions are mainly due to oxidation of alcohols by a coupled oxidation mechanism involving oxygen and wine di- and tri-hydroxyphenols. These oxidized compounds are responsible for lowering wine quality due to browning and loss of aromas.

Yeast cells, even in a non-viable physiological state, can uptake oxygen. This potential for oxygen consumption by non-viable yeast cells is now used for the protection of wines against oxidation during storage and/or aging. After years of collaborative research and development with the National Agricultural Research Institute (INRA) Montpellier in France, PURE-LEES LONGEVITY +™ was developed as an innovative solution for protection of wines against oxidation during storage and aging, allowing lower sulfite additions.

REDULESS



Reduces sulfur off-aromas; OMRI listed
Red, White, Rosé, Cider

#15116

1 kg

\$78.60

#15115

2.5 kg

\$150.20

REDULESS™ 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 while treating sulfur problems. It has also been shown to reduce phenol-related defects.

or filter after 72 hours. The maximum potential copper transfer, when used according to the recommendation, is 0.01 ppm.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

100–150 ppm	10–15 g/hL	0.8–1.2 lb/1000 gal
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Stage of Winemaking: Post-fermentation

Contact Time: 1-3 days

Impact: Reduction of sulfur off-odors

SILICA GEL

GELOCOLLE

Silica gel for improved settling, lees compaction and prevent overfining
Red, White, Rosé, Fruit Wines, Cider

#15783

5 L

\$78.00

GELOCOLLE is a negatively charged solution of suspended silica that can be used alone or in conjunction with INOCOLLE, COLLE PERLE, CRISTALLINE PLUS or other fining agents. GELOCOLLE initiates the flocculation of fining agents, speeds up clarification, and helps compact lees. GELOCOLLE also reduces the risk of leaving residual protein-based fining agent in the low tannin wines (overfining). GELOCOLLE can be used in hard-to-filter wines where it chelates proteins and other compounds facilitating filtration throughput.

Usage: GELOCOLLE can be used alone or in concert with other fining agents. To aid in settling GELOCOLLE should be added directly to wine 1 hour before the addition of protein-based fining agents (gelatin, isinglass, etc.). To prevent overfining

GELOCOLLE should be added directly into wine 1 hour after the addition of protein-based fining agents (gelatin, isinglass, etc.). Post-addition GELOCOLLE should be mixed thoroughly.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment 10-20°C (50-68°F). Reseal opened packaging immediately.

Do not refrigerate or freeze! Gelocolle solidifies at temperatures of less than 0°C(32°F). This process is irreversible.

Recommended Dosage *Bench trials recommended*

200-1000 ppm	20-100 mL/hL	0.75-3.8 L/1000 gal
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Note: Use 1.0 mL of GELOCOLLE to 1.0 mL of gelatin.

Stage of Winemaking: Wine fining	Contact Time: 1-2 weeks	Impact: Speeds settling, compacts lees, aids filtration
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ISINGLASS

CRISTALLINE PLUS

Isinglass to assist with clarification and brightening
Light Reds, White, Rosé, Fruit Wines

#15770

100 g

\$17.20

#15771

1 kg

\$145.10

CRISTALLINE PLUS is a blend of isinglass and citric acid stabilized with potassium metabisulfite. It has a strong positive charge and can improve clarity and filterability even in very difficult wines (wines made with botrytised grapes). It is favored by Pinot noir winemakers due to its gentle fining effect and brightening of aromas. CRISTALLINE PLUS is not sensitive to cold temperatures but may be slow to complete settling.

Usage: Dissolve CRISTALLINE PLUS in 150-200 times its weight of tepid water (15-20°C(59-68°F)). Allow to swell for 3

hours. Add additional water if solution is too viscous. Add homogenized solution to wine, taking care to mix well. Rack once lees are well settled.

Storage: Dated expiration. Store in a dry, odor-free and well-ventilated environment below 25°C (77°F). Reseal opened packaging immediately.

Recommended Dosage *Bench trials recommended*

15-30 ppm	1.5-3 g/hL	0.12-0.25 lb/1000 gal
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Stage of Winemaking: Pre-bentonite addition (wine)	Contact Time: 2-4 weeks	Impact: Clarification, brightening and aroma revealing
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MANNOPROTEINS AND GUM ARABICS

CLARISTAR



Natural liquid mannoprotein preparation for potassium tartrate stabilization

Red, White, Rosé

CLARISTAR® is a specialty liquid mannoprotein product from Oenobrande to aid in the tartrate 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 balance of red, white and rosé wines are enhanced. Users note improved aromatics as well as smoothness on the palate.

CLARISTAR is packaged as a liquid and its highly purified mannoproteins are 100% soluble in wine. It can be added directly and homogenizes easily. Thanks to CLARISTAR's enhanced potassium tartrate stabilization properties, wine can be treated immediately prior to bottling.

Usage: 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

Note 1: CLARISTAR is not appropriate for calcium tartrate stabilization.

Note 2: 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 TTB.gov.

Stage of Winemaking: Pre-bottling

Contact Time: Indefinitely

Impact: Inhibits potassium tartrate precipitation

FLASHGUM R LIQUIDE



Gum arabic for colloidal protection

Red, White, Rosé, Cider, Mead

FLASHGUM R LIQUIDE is a gum arabic derived from *Acacia seyal*. This preparation offers colloidal protection and gives perception of sweet and soft characters on the palate. Gum arabic products can help reduce the risk of colloidal deposits in unfiltered bottled wine. Natural polysaccharides reduce astringency and increase feelings of volume and fullness in the mouth. FLASHGUM R LIQUIDE can provide color protection in rosé and fruit wines.

Usage: FLASHGUM R LIQUIDE should be the last commercial product added to the wine. It is best to do inline additions

Stage of Winemaking: 24-72 hours Pre-bottling

Contact Time: Indefinitely

Impact: Colloidal protection, sweetness

#17000	2.5 L	\$205.60
#17001	20 L	\$1446.80

CLARISTAR should never be added to a wine prior to filtration with cellulose pads or DE/Earth/Velo filtration, or cellulose pads, however, it can be added prior to crossflow and sterile cartridge filtration.

Storage: Dated expiration. Store in a cool, dry environment at under 10°C(50°F). Once opened, use within 15 days. Can be frozen once.

Recommended Dosage *Bench trials recommended*

600-1250 ppm	60-125 mL/hL	2.27-4.7 L/1000 gal
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To ensure efficacy of a CLARISTAR addition for stability of any particular wine, bench trials MUST be run with laboratory analysis and verification. The amount of CLARISTAR required will be unique to each wine. Its effectiveness is dependent upon a wine's individual characteristics (e.g. protective colloid levels, pH, alcohol, etc.) in addition to a user's chosen stability criteria. 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. Please contact Scott Laboratories, Inc. for more information regarding the bench trial requirement.

#15772	1 L	\$24.20
#15773	5 L	\$78.60
#15769	20 L	\$266.00

24-72 hours prior to the final pre-membrane and membrane filtrations. Filterability trials prior to membrane filtration are recommended. If using on wine that is not going to be filtered, add FLASHGUM R LIQUIDE just prior to bottling.

Storage: Dated expiration. Store in a dry, odor-free environment at or below 25°C(77°F).

Recommended Dosage *Bench trials recommended*

400-1200 ppm	40-120 mL/hL	1.5-4.5 L/1000 gal
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ULTIMA SOFT

Mannoprotein/gum arabic with positive impact on stability and perceived softness and volume

Red, White, Rosé

ULTIMA SOFT is a unique blend of mannoproteins and gum arabic. On white wines, ULTIMA SOFT can soften, enhance body, add length, and lower astringency. On red wines, it helps maintain fruity aromas while helping to round out the mid-palate. If the wine is not to be filtered, this fully soluble product can be added immediately prior to bottling. Bench trials are recommended. Gum arabic and mannoproteins both have some stabilizing effects on wine, though the addition of this product is not a replacement for good winemaking practice or thorough analysis.

Usage: Add ULTIMA SOFT by mixing with 10 times its weight of water. ULTIMA SOFT should be the last commercial product

#17012

1 kg

\$137.10

added to the wine. Ideally it should be added to the wine using a dosing pump. If the wine is to be filtered, it is recommended that the addition be done 24–72 hours before the membrane filtration and that filterability trials be conducted prior to filtration.

Storage: Dated expiration. Store in a dry, well-ventilated environment with temperatures less than 25°C(77°F).

Recommended Dosage *Bench trials recommended*

150–300 ppm	15–30 g/hL	1.2–2.4 lb/1000 gal
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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 TTB.gov.

Stage of Winemaking: 24-72 hours pre-bottling

Contact Time: Indefinitely

Impact: Balancing and softening

FREQUENTLY ASKED QUESTIONS: FINING & STABILITY

Do I need to run bench trials before I use a fining agent?

Yes. Bench trials are essential to determine proper dosing, efficiency, and outcome in the wine. Each fining product works by a different mechanism and will react to each wine differently. Bench trials and cellar additions should be prepared and used the same way (same temperature, same mixing style, etc.). If bench trials are not performed, the winemaker may risk under or over fining and could harm the wine.

What are the main factors that influence how well fining works?

Fining can be a delicate operation. Product preparation and addition, product concentration, temperature, product age, pH, metal content and previous fining treatments are all factors that can influence the effectiveness of fining. It is important to follow the manufacturer's instructions and maintain accuracy when using fining products.

Which fining agents react with lysozyme?

Carbon, Carboxymethylcellulose (CMC) gum, silica sol, oak

chips and tannins will bind and precipitate lysozyme which will result in a decrease in activity. Bentonite will bind with and inactivate lysozyme.

Which fining agents do not react with lysozyme?

Gelatin, CASEINATE DE POTASSIUM and pectinase do not affect lysozyme activity. In fact, pectinase treatment will help maintain lysozyme activity by breaking down phenolic compounds that can bind lysozyme.

What is the best way to add fining agents?

There are several ways to add fining agents. Add the fining agent to the tank while mixing with a Guth agitator, dosing into a recirculation pump setup with a stand-alone dosing machine or with a Mazzei injector (see scottlab.com for more information).

Do I need to use hot water to swell the Erbslöh bentonites?

These bentonites are not hot water swelling and can be prepared in room temperature water. That is one of the many benefits of these products.

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MICROBIAL CONTROL

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.

MICROBIAL CONTROL ACTION

REMOVAL	INHIBITION	DESTRUCTION
Microorganisms are physically removed from the wine. Removal strategies include filtration, centrifugation and some types of fining followed by racking.	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 lysozyme at non-lethal concentration.	Microorganisms are killed and will not survive to replicate. Destruction strategies include NO BRETT INSIDE™ or BACTILESS™ additions, use of lysozyme (especially at pH >4.0) and the addition of alcohol (as in the case of fortified wines).

SELECTING MICROBIAL CONTROL AGENTS FOR SUCCESS

INCREASING VOLATILE ACIDITY	HIGH pH WINEMAKING	MICROBIAL STABILIZATION	ACETIC ACID BACTERIA (AAB)	LACTIC ACID BACTERIA (LAB)	YEAST
VA can be increased 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- <i>Saccharomyces</i> yeast.	The higher the pH, the more diverse the microbial population. Careful attention to wine microbiology and chemistry is advised.	Strategies include pH, temperature management, thoughtful rackings, filtration and the use of BACTILESS™, lysozyme, NO BRETT INSIDE or SO ₂ . Generally accepted SO ₂ levels to control microbes in winemaking are 0.5ppm molecular for bacteria and 0.8ppm molecular for yeast.	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 polysaccharides that can give clarification and filtration issues as well as changes in aromas and flavors. Control growth via BACTILESS™ and SO ₂ and by limiting oxygen.	LAB are responsible for converting malic acid into lactic acid. <i>Oenococcus oeni</i> is favorably associated with malolactic fermentation (MLF) but can also produce volatile acidity (VA) under certain conditions. <i>Pediococcus</i> and <i>Lactobacillus</i> are usually considered spoilage organisms. Some LAB can convert sugar to VA. Control growth with BACTILESS™, lysozyme or SO ₂ .	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 <i>Brettanomyces</i> is present and SO ₂ .

CHOOSING MICROBIAL CONTROL AGENTS

WINEMAKING STAGE	WINE TYPE	WINEMAKING GOAL	RECOMMENDED PRODUCTS
Incoming grapes and in press	Red, White, Rosé	Protect from indigenous yeast and bacteria	INODOSE GRANULES, POTASSIUM METABISULFITE
Juice/Must	White, Rosé	Protect from indigenous yeast and bacteria	LEVEL 2 INITIA™ (See pg 37), INODOSE GRANULES, LYSOZYME, POTASSIUM METABISULFITE
	Red	Protect from indigenous yeast and bacteria	GAIA™ (see pg 36), INODOSE GRANULES, LYSOZYME, POTASSIUM METABISULFITE
Fermentation	Red, White, Rosé	Protect from indigenous yeast and bacteria	INOCULATE WITH YEAST (see pgs 12-17)
	Red, White, Rosé	Protect from lactic acid bacteria during sluggish/stuck fermentation	INODOSE GRANULES, LYSOZYME, POTASSIUM METABISULFITE
	Red, White, Rosé	Delay MLF	INODOSE GRANULES, LYSOZYME, POTASSIUM METABISULFITE
	Red, White, Rosé	Inhibit MLF	BACTILESS™, INODOSE GRANULES, INODOSE TABLETS, LYSOZYME, POTASSIUM METABISULFITE
	Red, White, Rosé	Control <i>Brettanomyces</i>	Inoculate ML bacteria with yeast (co-inoculation) or add ML bacteria as soon as alcoholic fermentation is complete (see ML section pg 59)
Aging	Red, White, Rosé	Control lactic acid bacteria	BACTILESS™, INODOSE GRANULES, INODOSE TABLETS, LYSOZYME, POTASSIUM METABISULFITE
	Red, White, Rosé	Control acetic acid bacteria	BACTILESS™, INODOSE GRANULES, INODOSE TABLETS, POTASSIUM METABISULFITE
	Red, White, Rosé	Control <i>Brettanomyces</i>	INODOSE GRANULES, INODOSE TABLETS, NO BRETT INSIDE™, POTASSIUM METABISULFITE
Pre-Bottling	Red, White, Rosé	Control spoilage organisms	INODOSE GRANULES, INODOSE TABLETS, POTASSIUM METABISULFITE

LYSOZYME, CHITOSAN, AND CHITIN-GLUCAN

DELVOZYME LYSOZYME

Lactic acid bacteria inhibitor for reds, whites, and rosés

#16404

5 kg

\$974.00

Lysozyme is used to control or inhibit lactic acid bacteria including *Oenococcus* spp., *Pediococcus* 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 bac-

teria and the number of cells present. Recommended contact time is seven days, after which wine should be removed from lysozyme by racking. In red wines, lysozyme will interact with tannins rendering it inactive. In white wines lysozyme should be removed with 5-10g/hL bentonite.

Recommended Dosage

Lysozyme Applications		Lysozyme Dose			Timing of Addition
Inhibit Growth of LAB in Must and Juice Inhibit spoilage characters due to uncontrolled microbial growth. This is especially important in high pH conditions or with grapes containing rot.		200 ppm	20 g/hL	0.75 g/gal	Add prior to fermentation
Protection During Stuck/Sluggish Fermentations Reduce the risk of VA production by lactic acid bacteria and limit use of SO ₂ to encourage yeast growth		250–400 ppm	25–40 g/hL	0.94–1.50 g/gal	Add at first signs of a stuck fermentation
Delay MLF/Post-MLF Stabilization Protect wine without the negative effects of SO ₂ during maceration or aging; allow for implantation of selected bacteria; delay MLF to increase efficiency of Phase I micro-oxygenation	Delay	100–200 ppm	10–20 g/hL	0.38–0.75 g/gal	Add at juice stage or immediately after alcoholic fermentation
	Stabilize	250–500 ppm	25–50 g/hL	0.94–1.90 g/gal	Add immediately after MLF completion
Inhibit MLF when Blending Partial and Complete ML Wines		300–500 ppm	30–50 g/hL	1.10–1.90 g/gal	Add during blending

Usage: Rehydrate lysozyme in 5–10 times its weight of warm water. Stir gently for one minute and avoid foaming. Allow to soak for 45 minutes. Repeat until the solution is a clear, colorless liquid. To ensure accurate results, wait one week before culturing for microbes. If lysozyme-treated samples are assessed too quickly after treatment, results may show a false-positive for bacterial growth. **It is important to note that lysozyme requires a minimum seven day contact time to allow the enzyme to work.**

Storage: Store in dry form for 3 years at 18°C(65°F). Once rehydrated, Lysozyme should be used immediately.

Warning: In the case of low color potential grapes such as Pinot noir, caution is needed when adding lysozyme 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. Lysozyme is only effective against gram-positive bacteria and has no effect on yeast or gram-negative bacteria.

DELVOZYME LYSOZYME OR BACTILESS?

Which lactic acid bacteria inhibitor you choose will depend on several factors. Has malolactic fermentation finished? Is malolactic fermentation desired? What is the microbial load? Is the wine destined for export?

LYSOZYME is a natural product isolated from egg whites that is active against lactic acid bacteria but not acetic acid bacteria. Lysozyme can be used at any stage of winemaking, even if malolactic fermentation is still desired. Lysozyme

should also be your inhibitor of choice if you are exporting the wine.

BACTILESS™ is fungal-derived and targets lactic acid bacteria and acetic acid bacteria. BACTILESS should not be used unless malolactic fermentation is complete or not desired. BACTILESS is listed as an ingredient for domestic wine production and, at this time, should not be used in wines destined for export.

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BACTILESS LALLEMAND

Acetic acid and lactic acid bacteria control

BACTILESS™ is a 100% natural, non-allergenic 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. BACTILESS cannot decrease any sensory contribution already produced by spoilage bacteria.

Usage: Suspend BACTILESS in 5–10 times its weight of cool water or wine (BACTILESS is insoluble, so it will not go into solution). BACTILESS should be mixed to obtain a homogeneous addition. Leave BACTILESS in contact with the wine for 10 days and then conduct a clean racking. If malolactic fermentation is desired, BACTILESS should not be added until after MLF is complete.

To assess BACTILESS effectiveness wait 20–30 days post-

#15232	500 g	\$84.70
Recommended Dosage		
200–500 ppm	20–50 g/hL	1.67–4.16 lb/1000 gal
		45–113 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 TTB.gov.

IMPACT OF BACTILESS™ ON SIX DIFFERENT ORGANISMS 30 DAYS AFTER TREATMENT

	Control	BACTILESS at 20 g/hL
Acetic acid bacteria (cells/mL)	2,033,333	54,800
Lactobacillus brevis (cells/mL)	35,733	1,030
Lactobacillus plantarum (cells/mL)	99,333	4,867
Lactobacillus kunzei (cells/mL)	313	73
Oenococcus oeni (cells/mL)	1,733,333	46,667
Pediococcus species (cells/mL)	100,033	2,700

Trials conducted by ETS Laboratories, St. Helena, California. Trial results are the average of three replicates.

NO BRETT INSIDE LALLEMAND

Brettanomyces spp. control agent

NO BRETT INSIDE™ is a preparation of chitosan that specifically targets *Brettanomyces* cells. The active ingredients work in two ways: 1) *Brettanomyces* cells adsorb onto the surface of NO BRETT INSIDE, increasing the particle size causing the *Brettanomyces* spp. to settle out of the wine and 2) a biological action occurs which results in cell death. This double action of NO BRETT INSIDE helps control contaminating populations to preserve wine quality.* However, NO BRETT INSIDE cannot decrease any sensory contribution already produced by *Brettanomyces*.

Usage: Suspend NO BRETT INSIDE in 5 times its weight of cool water (NO BRETT INSIDE is insoluble, so it will not go into solution). NO BRETT INSIDE can be added during a pump-over or tank/barrel mixings to ensure a homogeneous addition. Leave the NO BRETT INSIDE in contact with the wine for 10 days and then conduct a clean racking. If malolactic fermentation is desired, NO BRETT INSIDE should not be added until after MLF is complete.

To assess NO BRETT INSIDE effectiveness, wait 20–30 days post-racking before microbial analysis by traditional plating, microscopic observations or RT-PCR.

Storage: Dated expiration. Store in a dry, odor-free environment below 25°C(77°F).

*NO BRETT INSIDE should be added post-MLF.

#16410	100 g	\$105.80
Recommended Dosage		
40–80 ppm	4–8 g/hL	0.33–0.67 lb/1000 gal
		9–18 g/60 gallon barrel

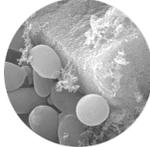
Note: This product contains ingredient(s) currently listed by the TTB as acceptable in good commercial winemaking practices in 27 CFR 24.250. For more information please visit TTB.gov.

VISUALIZATION OF NO BRETT INSIDE™ EFFECT ON BRETTANOMYCES



Before

Scanning Electron Micrograph x 20,000 magnification Brettanomyces cells prior to being treated with NO BRETT INSIDE.



After

Scanning Electron Micrograph x 20,000 magnification Brettanomyces cells treated with 4 g/hL of NO BRETT INSIDE. Image shows Brettanomyces cells attached to the surface of the chitosan.

Images courtesy of Biljana Petrova and Dr. Charles G. Edwards, Washington State University, Pullman, WA.

SULFUR DIOXIDE AND TARTARIC 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 INODOSE TABLETS are an easy and effective way to add SO₂ to grapes, juice or wine.

INODOSE GRANULES

Effervescent sulfur dioxide granules

#15780	100 g	\$11.10
#15781	400 g	\$22.20

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 granules release a precise dose of SO₂. Inodose granules are packaged in pre-measured 100 g and 400 g

packs. INODOSE GRANULES are perfect for SO₂ additions to incoming must, juice, and wines prior to clarification and fining. The potassium bicarbonate in these granules assists with mixing and has little or no effect on pH.

INODOSE TABLETS

Effervescent sulfur dioxide tablets

#15775	2 g (48/box)	\$36.30
#15776	5 g (42/box)	\$40.30

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.

Storage for Granules and Tablets: Store in a dry, well-ventilated environment at temperatures below 25°C (77°F). Once the pack has been opened it should be used immediately.

Dosage: INODOSE GRANULES and INODOSE TABLETS Conversion Chart— PPM of Total Sulfur Dioxide

SO ₂ Dose	1 Liter	1 Gallon	60 Gallons	100 Gallons	1000 Gallons
2 g	2,000	529	9	5	0.5
5 g	5,000	1,321	22	13	1.3
100 g	100,000	26,420	440	264	26.4
400 g	400,000	105,680	1,761	1,057	106

Note: The SO₂ products contribute a precise 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 g, 5 g, etc.

Usage: Various applications include:

- Add to gondolas or picking bins to inhibit oxidation of grapes and juice.
- Add during transport of must or juice to inhibit indigenous yeast and bacteria.
- Add in tanks before or after fermentation.
- Add directly into barrels after malolactic fermentation.
- To make SO₂ additions to wine during aging.

POTASSIUM METABISULFITE

#POTMETA1K	1 kg	\$6.10
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Potassium metabisulfite can be used throughout the wine-making process from grape receipt to finished wine.

TARTARIC ACID

#TARTARIC5	5 kg	\$97.80
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Used to correct tartaric acid deficiencies, to decrease the pH and/or increase the titratable acidity of grapes, juice and wine thereby enhancing microbial stability, wine color and flavor.

LYSOZYME

How long does it take for lysozyme 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 lysozyme starts working immediately, it does not necessarily kill all the bacteria immediately. If lysozyme-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 lysozyme effective against all lactic acid bacteria?

No. Some lactic acid bacteria strains show resistance to lysozyme. Bench trials **MUST** be performed to accurately determine the effectiveness and correct addition rate of lysozyme for your wine.

How soon after a lysozyme addition can I bottle?

Wait at least one week, even if you have diligently completed your lab trials. Lysozyme is a protein and may produce lees (especially in reds) and affect the protein stability in whites. It is not recommended to bottle white wines that contain residual lysozyme.

Will lysozyme treatment affect the color of red wine?

Lysozyme 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. Lysozyme 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) lysozyme should be added with extreme care before alcoholic fermentation is complete, however, the consequences of adding lysozyme 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 INODOSE TABLET of SO₂ to my 60 gallon barrel. Does this mean I have 22 ppm of free SO₂?

No. You will have added 22 ppm total SO₂. The amount of free SO₂ highly depends on pH, residual sugar, solids, etc.

BACTILESS™

Do I have to rack my wine after 10 days?

Yes.

Can I add BACTILESS™ to the top of my vessel without mixing?

No. A thorough mixing is essential so that the BACTILESS and the bacteria can interact.

Does BACTILESS™ have an impact on yeast?

Bactiless has no impact on *S. cerevisiae*. It may 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 BACTILESS matrix, but this is not the best use of the product and it may not be reproducible.

What if I have spoilage bacteria and Brettanomyces present?

You can use both BACTILESS™ and NO BRETT INSIDE™. You may wish to adapt the dosage depending on the dominant organism and your main concern. If *Brettanomyces* is the main concern, then trial 4g/hL of NO BRETT INSIDE and 10g/hL BACTILESS. If bacteria control is the main goal, then trial 2g/hL of NO BRETT INSIDE and 20g/hL BACTILESS. Rack after 10 days and check the efficacy 30 days after addition. Follow up with a second treatment if necessary.

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 lysozyme or SO₂.

Does BACTILESS™ impact wine sensory character?

BACTILESS is neutral regarding its sensory impact. It is also important to note that it does not have the ability to remove any negative sensory compounds that may have been produced by bacterial contaminants prior to treatment.

NO BRETT INSIDE™

Do I have to rack off the NO BRETT INSIDE™ lees after 10 days?

Yes.

Can I just add NO BRETT INSIDE™ to the top of my vessel?

No. A thorough mixing is essential. *Brettanomyces* is associated with the lees. Mixing ensures that NO BRETT INSIDE can trap *Brettanomyces* and begin to control the infection.

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 wine?

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™?

The source is the same (*Aspergillus niger*), but the formulations are different. Therefore they control different microbial populations.

What if I have spoilage bacteria and Brettanomyces present?

You can use both BACTILESS™ and NO BRETT INSIDE™. You may wish to adapt the dosage depending on the dominant organism and your main concern. If *Brettanomyces* is the main concern, then trial 4g/hL of NO BRETT INSIDE and 10g/hL BACTILESS. If bacteria control is the main goal, then trial 2g/hL of NO BRETT INSIDE and 20g/hL BACTILESS. Rack after 10 days and check the efficacy 30 days after addition. Follow up with a second treatment if necessary.

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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
- Does not require hazardous shipping
- No chlorine, other halogens, phosphates, silicates or fillers
- Safer and lower environmental impact than bulk chemical cleaners

WATER SAVINGS WITH AIRD PRODUCTS

AiRD PROCESS VS CLASSICAL METHOD

DUE TO ITS UNIQUE FORMULATION, AIRD PRODUCTS CAN RESULT IN UP TO 50% WATER SAVINGS.*

AiRD Process	Water Used*	Classical Method	Water Used*
Rinse	100 gallons	Rinse	100 gallons
AiRD Product	200 gallons	Caustic	200 gallons
Short Rinse	100 gallons	Long Rinse	200 gallons
TOTAL	400 gallons	Citric	200 gallons
		Rinse	100 gallons
		TOTAL	800 gallons

*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

	Cleaning Agents		
	CLEANSKIN-K	DESTAINEX-LF	OAK RESTORER
	113	113	113
Page#	113	113	113
Dosage	1.0-4.0% w/v	0.5-1.5% w/v	1.0-2.0% w/v
Water temperature for use	68-140°F 20-60°C	104-140°F 40-60°C	68-86°F 20-30°C
pH (1% solution)	~11.3	~10.8	~10.65
Removes tartrates	☼	☾	☼
Removes color	☾	☼	☼
Microbial neutralizing		☾	☼
General purpose cleaning	☾	☼	
Barrel cleaning			☼

CLEANING AGENTS

CLEANSKIN-K

Multi-purpose cleaner and tartrate remover

Tanks and Equipment

CLEANSKIN-K is a 100% active, water soluble, multi-purpose potassium-based cleaning product for use in the winery. This carbonate formulation uses the power of oxygen to effectively clean stainless steel and associated materials. CLEANSKIN-K can be used in tanks, presses, destemmers, juice channels and more to remove tartrate crystals. Secondly, it is effective at removing wine color, protein and organic soils. In addition to the potassium carbonate, CLEANSKIN-K contains propri-

etary percarbonates, chelation and sequestering aids, polysurfactants and a rinse aid to leave your surfaces bright, clean, neutral and spot free.

Storage: Store in a dry, odor-free environment between 10–20°C(50–68°F) away from sunlight.

Dosage

1.0–4.0% w/v	10–40 g/L	1.3–5.4 oz/gal
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DESTAINEX-LF (LOW FOAMING)

Multi-purpose oxidizing cleaner for organic soils and molds

Bottling systems, winery surfaces, lines, equipment and difficult-to-rinse systems

DESTAINEX-LF is a proprietary sodium percarbonate based cleaning agent with microbial neutralizing abilities. This highly effective formulation can be used at low levels to remove wine color, protein stains, mold, mildew, and biofilms from wine contact surfaces such as: stainless steel, galvanized metals, concrete, polyethylene (low and high density), polypropylene, plastics, flexible hoses, glass and powder-coated surfaces.

DESTAINEX-LF can be used in both automated (CIP) and manual systems. The sodium percarbonate in DESTAINEX-

LF is complemented with proprietary surfactants and chelation agents, water conditioning materials and rinse aids for a bright, clean and spot free neutral surface.

Storage: Store in a dry, odor-free environment between 10–20°C(50–68°F) away from sunlight.

Dosage

0.5–1.5% w/v	5–15 g/L	0.7–2.0 oz/gal
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OAK RESTORER

Oak cleaner and refresher

Barrels, staves and oak chips

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 subse-

quent neutralization is required. OAK RESTORERS leave your wooden surfaces refreshed, odorless and pH neutral.

Storage: Store in a dry, odor-free environment between 10–20°C(50–68°F) away from sunlight.

Dosage

0.5–2.0% w/v	5–20 g/L	0.7–2.7 oz/gal
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INSTRUCTIONS FOR CLEANING PRODUCTS

Consult the chart on pg 112 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 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.

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FRUIT WINES & MEAD

Making wine from sources other than grapes can be quite a different process and can pose many challenges. However, numerous tools used in grape fermentation can also be utilized in fruit or mead fermentations.

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

◆ Highly Recommended
◊ Recommended

Yeast	Fruit	Mead	Page#
LALVIN 71B™	◆		18
CVW5™	◆	◆	23
LALVIN DV10™	◆	◆	23
LALVIN EC1118™	◆	◆	23
LALVIN ICV D47™	◆		26
K1 (V1116)™	◆	◆	28
LALVIN ICV OKAY™	◆		27
LALVIN QA23™	◆	◆	30
LALVIN R2™	◆		30
LALVIN SENSY™	◆		32
VIN 13	◆	◆	33

Nutrients			
	Fruit	Mead	Page#
GO-FERM PROTECT EVOLUTION™	◆	◆	46
FERMAID K™	◆	◆	52
FERMAID O™	◆	◆	53

Malolactic Bacteria			
	Fruit	Mead	Page#
LALVIN (MBR) 31™	◆		63
O-MEGA™	◆		63
SOLO SELECT™	◆		65

Enzymes			
	Fruit	Mead	Page#
SCOTTZYME® BG	◆		88
SCOTTZYME® HC	◆		89
SCOTTZYME® KS	◆		90
SCOTTZYME® SPECTRUM	◆		90
SCOTTZYME® PEC5L	◆		90

Tannins	Fruit	Mead	Page#
SCOTT'TAN™ FT BLANC	◆		74
SCOTT'TAN™ FT BLANC CITRUS	◆	◆	75
SCOTT'TAN™ FT BLANC SOFT	◆	◆	75
SCOTT'TAN™ FT COLORMAX	◆		76
SCOTT'TAN™ FT ROUGE	◆		76
SCOTT'TAN™ FT ROUGE BERRY	◆		76
SCOTT'TAN™ FT ROUGE SOFT	◆		77
SCOTT'TAN™ RADIANCE	◆		77

Fining/Stability Agents			
	Fruit	Mead	Page#
BENTOLACT S	◆		97
CASÉINATE DE POTASSIUM	◆		97
COLLE PERLE	◆		101
CRISTALLINE PLUS	◆	◆	103
FRESHPROTECT	◆	◊	97
FERMOBENT	◆		96
FLASHGUM R LIQUIDE	◆	◆	104
GELCOLLE	◆	◆	103
INOCOLLE	◆		101
NACALIT	◆		96
POLYCACEL	◆		98
REDULESS™	◆	◆	102

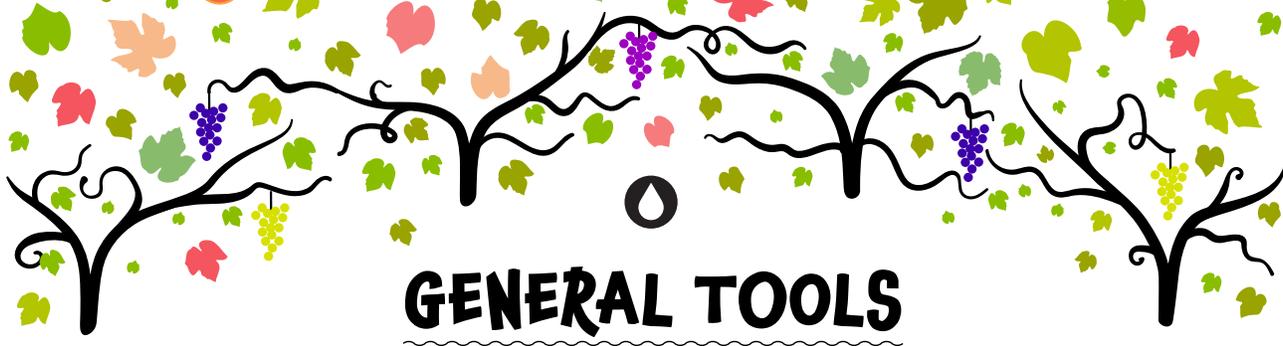
Yeast Derivative Nutrients			
	Fruit	Mead	Page#
GLUTASTAR™	◆	◆	54
ICV NOBLESSE™	◆	◆	55
OPTI-MUM RED™	◆		56
OPTI-RED™	◆		56
OPTI-WHITE™	◆	◆	56

SELECTING PRODUCTS FOR SUCCESS IN FRUIT WINES & MEAD

YEAST	NUTRIENTS	YEAST DERIVATIVE NUTRIENTS	MALOLACTIC BACTERIA
<p>Using a selected yeast strain can maximize the positive attributes that come with that strain (e.g. mouthfeel, complexity, aromas, fermentation kinetics), while avoiding unpleasant aromas and poor fermentation kinetics that may come with a “wild” strain. The key to yeast choice is matching it to the wine style, and more importantly, the fermentation conditions. Proper rehydration and acclimatization of the selected yeast strain is essential.</p>	<p>Fruit wines and mead are notorious for having low nutrient content. Proper nutrition for both yeast and malolactic bacteria is essential to ensure good fermentation kinetics, with positive flavor and aroma profiles. Nutrients can also help to avoid stuck or prolonged fermentations and H₂S and VA problems.</p>	<p>GLUTASTAR™ and OPTI-WHITE™ are used either pre-fermentation or early in the fermentation to increase mouthfeel, help avoid browning and protect freshness and aromas during aging. OPTI-RED™ and OPTI-MUM RED™ are high in polyphenol reactive polysaccharides. Add at the onset of fermentation to enhance mouthfeel and to help stabilize color. NOBLESSE™ can be used to improve the perception of fruit and roundness and softness in the finish. It may be added at the onset or near the end of fermentation.</p>	<p>Malolactic fermentation can soften wines made from fruit high in malic acid. Many fruits have unbalanced acid profiles and the resulting wine may have a very low pH. Be sure to choose a bacteria strain that works under the conditions of the fruit. If the winemaker’s goal is to reduce acid without adding flavor/aroma characteristics, then a neutral strain should be used. Other strains can produce subtle changes in flavor and/or texture.</p>
TANNINS	ENZYMES	FINING AGENTS	MICROBIAL CONTROL
<p>Tannins help give wine its structure and contribute to its longevity. Honey and some types of fruit contain very little natural tannin. Enological tannins can be used to add structure and enhance flavor and aroma. They reduce the risk of oxidation and help stabilize wine color. SCOTT’TAN™ FT BLANC SOFT adds to the midpalate texture without darkening lighter colored fruit wines and meads. For darker meads and fruit wine, there is a whole array of complex tannins derived from oak, exotic wood, grape skins and seeds, and more. For color stabilization, there is SCOTT’TAN™ FT COLORMAX, which is most effective when used in conjunction with SCOTT’TAN™ FT ROUGE or FT ROUGE SOFT. SCOTT’TAN™ ONYX, RADIANCE, and ROYAL are ideal tannins for a finishing touch, even just before bottling.</p>	<p>All fresh fruit contains pectin. For many fruits, excess pectin can be responsible for inadequate juice extraction, lack of clarity, slow sedimentation and poor filterability. Pectinases break down pectin. When pectinases are used at pressing, they result in the release of more juice. At the juice stage, enzymes speed settling of solids prior to racking and fermentation. In finished wine, pectinases aid filterability and final clarification. For most fruit wines, a combination of SCOTTZYME® PEC5L and HC will work for most situations. For certain difficult situations, such as fruit compromised by rot, stronger enzymes like SCOTTZYME® KS or LALLZYME MMX™ may be necessary. Both of these should only be used on juice or wine according to directions. Some enzymes, such as SCOTTZYME® BG and RAPIDASE® REVELATION AROMA, release aromas that are bound to sugars, thereby increasing the aromatic intensity of the wine.</p>	<p>Most fining of fruit wine and mead is done for clarification. The fining agents pull minute particles together. The heavier particles then settle faster and form a more compact sediment. QI’UP XC is effective at clarifying the finished wine, as is the combination of CRISTALLINE PLUS (isinglass) counter-fined with the negatively-charged GELOCOLLE. Fining agents can also be used to remove oxidized phenolic compounds from young wines. CASÉINATE DE POTASSIUM (casein) and POLYCEL (PVPP) are effective at removing the bitterness and browning caused by oxidation of young wines. REDULESS™ is used to treat wines suffering from reduced sulfur compounds (e.g. H₂S). For fruit wines subject to protein instability, bentonite fining is the only way to remove the unstable proteins.</p>	<p>Sulfur dioxide (SO₂), Lysozyme, BACTILESS™ and NO BRETT INSIDE™ can all be used to protect wine quality against microbial spoilage. Although its primary use is microbial control, SO₂ also helps reduce the risk of oxidation. INODOSE SO₂ Granules and Tablets are pre-measured, and no mixing is necessary once added to the wine. No Brett Inside specifically targets and kills <i>Brettanomyces</i>. Lysozyme attacks gram-positive bacteria, such as <i>Lactobacillus</i>, <i>Pediococcus</i> and <i>Oenococcus</i>. BACTILESS™ kills a wider range of bacteria, from lactic acid bacteria to acetic acid bacteria. Both BACTILESS™ and Lysozyme can be used to delay or inhibit malolactic fermentation.</p>

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GENERAL TOOLS

CALCULATIONS and CONVERSIONS

VOLUME CONVERSIONS	
mL = milliliter, fl oz = fluid ounce, gal = gallon, L = liter, hL = hectoliter	
1 mL	= 0.035 fl oz
1 fl oz	= 30 mL
1 L	= 1000 mL
1 L	= 0.2642 gal
1 gal	= 3785 mL
1 gal	= 3.785 L
1 hL	= 100 L
1 hL	= 26.4 gal

MASS CONVERSIONS	
mg = milligram, g = gram, kg = kilogram, lb = pound	
1 kg	= 1000 g
1 kg	= 2.205 lb
1 g	= 1000 mg
1 lb	= 453.6 g
1 lb	= 0.4536 kg
1 metric ton	= 1000 kg
1 metric ton	= 2205 lb
1 US ton	= 2000 lb
1 US ton	= 907 kg

INTERNET CONVERSION PROGRAMS

onlineconversion.com	wineadds.com	winebusiness.com/tools
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TEMPERATURE CONVERSIONS

F° = Degree Fahrenheit C° → F° = (C° x 9/5) + 32	F°	0	32	40	50	60	70	80	90	100	110	120
C° = Degree Celsius F° → C° = (F° - 32) x (5/9)	C°	-18	0	4	10	16	21	27	32	38	44	49

OTHER CONVERSIONS

1 lb/1000 gal = 454 g/1000 gal = 0.454 kg/1000 gal = 120 mg/L = 27.2 g/barrel* = 0.120 g/L
1 kg/hL = 1000 g/hL = 10,000 mg/L = 2.271 kg/barrel* = 10 g/L
1 ppm = 1 mg/L
*barrel = 60 gal = 227.1 L
1°Brix = 1% sugar (wt/vol)

*Standard barrel size is 60 gallons. 59 and 70 gallon barrels are also common and sometimes the three are not visually distinct in size.

BENCH TRIAL CALCULATOR

We recommend performing bench trials with many of our products including lysozyme, tannins, enzymes and fining agents. This calculator will help determine the amount of any given stock solution to achieve a range of concentrations in various-sized sample bottles.

FOR POWDERED PRODUCTS (LYSOVIN, TANNINS, FINING AGENTS, ETC.)	
mLs of stock solution to add per sample bottle	= $\frac{(\text{sample size in mLs}) \times (\text{desired concentration in ppm}) \times (0.0001)}{\% \text{ concentration (w/v) of stock solution}}$

FOR LIQUID PRODUCTS (SCOTTZYMES, GELATINS, ETC.)	
mLs of stock solution to add per sample bottle	= $\frac{(\text{sample size in mLs}) \times (\text{desired concentration in mLs/1000 gal}) \times (0.000024)}{\% \text{ concentration (v/v) of stock solution}}$

For example: If you have a 10% stock solution of Color Pro and wish to create a 150 mL/1000 gal dose in a 375 mL sample bottle you would calculate:

$$\text{mLs of stock solution} = \frac{(375) \times (150) \times (0.000024)}{10} = 0.135 \text{ mL}$$

Therefore, you would need to add 0.135 mL of a 10% Color Pro stock solution to a 375 mL bottle to represent a concentration of 150 mL/1000 gal.

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 (rehydration) 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

TOOLS:

100 mL graduated cylinder or volumetric flask.	Scale that can weigh to a tenth of a gram.	1 mL pipette divided into 100th's.	5 mL pipette divided into 1/10 mL.
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PROCEDURE

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 10.0 grams of product to total volume of 100 mL, respectively. After weighing out the product, mix it with 80 mL of water until either dissolved or all lumps are gone. Put it 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 to stir up the product in the wine might be necessary to duplicate what would take place in the barrel or tank.
6. Taste and/or test after the appropriate waiting period. For fining agents, this might just be as long as it takes the agent to settle. For tannins, it should be at least several days, but it is even better if the trial can sit for at least two weeks.

Cheat Sheet:

Desired Dosage	Stock Solution	mLs of solution to add to 375 mL bottle	mLs solution to add to 750 mL bottle
100 ppm	2.5%	1.5	3.0
	5.0%	0.75	1.5
	10.0%	0.375	0.75
200 ppm	2.5%	3.0	6.0
	5.0%	1.5	3.0
	10.0%	0.75	1.5
300 ppm	2.5%	4.5	9.0
	5.0%	2.25	4.5
	10.0%	1.125	2.25
400 ppm	2.5%	6.0	12.0
	5.0%	3.0	6.0
	10.0%	1.5	3.0
500 ppm	2.5%	7.5	15.0
	5.0%	3.75	7.5
	10.0%	1.875	3.75

FINISHING KIT FOR BENCH TRIALS

#SLQDTAN	Finishing Kit for Bench Trials	\$108.00
#37101	20-200µL Micropipette	\$137.50
#37102	100-1000µL Micropipette	\$137.50
#37111	5-200µL Micropipette tips (96 tips)	\$13.00
#37112	100-1250µL Micropipette tips (96 tips)	\$15.00

Finishing agents are valuable tools for perfecting a wine. Our Finishing Kit for Bench Trials includes pre-dissolved tannins and stability agents for ease of running bench trials.

Bench trials are a very important step to determine the right fit of any of these products. Finding the correct product to work with the matrix of your wine, as well as the correct dosage, might take several trials.

Finishing aids have been found to help with:

- Masking pyrazines/greenness
- Maximizing fruit
- Boosting/increasing mid-palate
- Increasing aromatic intensity
- Increasing body
- Help minimize impact of *Brettanomyces*
- Brighten acid
- Impart oak character
- Increase perception of sweetness

This kit contains:

- SCOTT™TAN™ FT BLANC (pg 74)
- SCOTT™TAN™ FT BLANC SOFT (pg 75)
- SCOTT™TAN™ FT BLANC CITRUS (pg 75)
- SCOTT™TAN™ FT ROUGE BERRY (pg 76)
- SCOTT™TAN™ COMPLEX (see scottlab.com)
- SCOTT™TAN™ ESTATE (pg 74)
- SCOTT™TAN™ RICHE (pg 78)
- SCOTT™TAN™ RICHE EXTRA (pg 78)
- SCOTT™TAN™ ONYX (pg 77)
- SCOTT™TAN™ RADIANCE (pg 77)
- SCOTT™TAN™ ROYAL (pg 78)
- REDULESS™ (pg 102)
- ULTIMA SOFT (pg 105)
- FLASHGUM R LIQUIDE (pg 104)
- THE OAK LAB™ THERMIC OAK SAMPLES, Profiles 1-5 (pgs 81-82)

Note: Tannin solutions have been prepared for ease of use in bench trials. Our tannins are sold as a powder or granulate.



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PRODUCT STORAGE AND STABILITY GUIDELINES

Product	Optimal Storage Temperature (unopened)	Recommended Storage (once opened)
Cleaning Products (AiRD)	10–20°C (50–68°F)	Tightly sealed, dry, odor-free environment, protected from light.
Enzymes- LALLZYME	25°C (77°F)	Dry: Tightly sealed, dry, odor-free environment. Rehydrated: Use within a few hours.
Enzymes- RAPIDASE CLEAR EXTREME	4–8°C (39–45°F)	Dry: Tightly sealed, dry, odor-free environment. Rehydrated: Use within a few hours.
Enzymes- RAPIDASE EXPRESSION AROMA & RAPIDASE REVELATION AROMA	5–15°C (41–59°F)	Dry: Tightly sealed, dry, odor-free environment. Rehydrated: Use within a few hours.
Enzymes- SCOTTZYMES	1–2 years: Store liquid forms: @ 4°C (39°F) Store dry forms: @ 18–24°C (60–77°F)	Rehydrated: Use within a few hours.
Fining Agent- GELOCOLLE	10–20°C (50–68°F). Do not freeze.	Use immediately.
Fining Agent- Other not listed	Below 25°C (77°F)	Tightly sealed, dry, odor-free environment.
LALVIGNE	25°C (77°F)	Tightly sealed, dry, odor-free environment.
Lysozyme	Dry: 3 years @ 18°C (65°F)	Use immediately.
Malolactic Bacteria	Short term: @ 4°C (39°F) Long term: @ –18°C (0°F)	Use immediately.
Microbial Control- BACTILESS & NO BRETT INSIDE	Below 25°C (77°F)	Tightly sealed, dry, odor-free environment.
Microbial control- INODOSE GRANULES & TABLETS	25°C (77°F)	Use immediately.
Microbial Control- Potassium Metabisulfite	25°C (77°F)	Use immediately.
Nutrients- Yeast, Bacteria And Yeast Derivative Nutrients	18°C (65°F)	Tightly sealed, dry, odor-free environment.
Oak	25°C (77°F)	Tightly sealed, dry, odor-free environment.
Stability- CLARISTAR	10°C (50°F)	Use immediately.
Stability- FLASHGUM R LIQUID	Below 25°C (77°F)	Tightly sealed, dry, odor-free environment.
Stability- ULTIMA SOFT	Below 25°C (77°F)	Tightly sealed, dry, odor-free environment.
Tannins	18°C (65°F)	Tightly sealed, dry, odor-free environment.
Tartaric Acid	25°C (77°F)	Tightly sealed, dry, odor-free environment.
Yeast- CVW5 & IONYS _{WF}	4–11°C (39–55°F)	Use immediately.
Yeast- EXOTICS MOSAIC & NOVELLO	5–15°C (41–59°F)	Use immediately.
Yeast- FLAVIA & GAIA	4–11°C (39–55°F)	Use immediately.
Yeast- INITIA	4°C (39°F)	Use immediately.
Yeast- Other not listed	20°C (68°F)	Use immediately.

Note: Most products have an expiration date on the package. Please check the product and store appropriately.

HOW TO ORDER

SCOTTLAB.COM

Our easy-to-use website makes planning and submitting your orders easier than ever. Try one, or all, of these convenient features:

QUICK-ORDER SHOPPING CART

Our website's shopping cart allows you to quickly enter orders without navigating to every item page. Simply open the site directly to scottlab.com/shop/basket and start entering search terms or item numbers.

PDF ORDER FORM

Use order planner at scottlab.com/order-planner to easily plan and organize your winemaking products list in one place.

ORDER UPLOAD

Do you love spreadsheets as much as our web team? Assemble your order in a spreadsheet and you can load a CSV file directly as a shopping cart. Head to scottlab.com/upload-cart to learn more and download the CSV template.

REORDER

Head to the My Account section (scottlab.com/profile) of the site and you can search back through your past Invoices and Shipments. If you have an order that you want to re-create, click the handy "Reorder" button to load the items from that invoice or shipment into your shopping cart.

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.

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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WHO WE ARE

FERMENTATION & ENOLOGY

Yeast has been the heart of our company since our founding in 1933 as the Berkeley Yeast Laboratory. Our first commercial yeast consisted of strains from the University of California at Berkeley who maintained the wine yeast culture collection during Prohibition. Strains were provided on agar slants until the 1960s. In 1974, we found our long-term partner in Lallemand who began drying strains for us.

In the years that have followed, our portfolio has expanded to offer everything you'll see in this handbook—**nutrients, malolactic bacteria, enzymes, tannins, stability and fining agents**, and most recently, **oak infusion products**.

FILTRATION MEDIA & VELCORIN®

We supply a wide range of **filtration media** and **microbial control solutions**. From established technologies like pad filtration to cutting-edge stability solutions like Velcorin®, we have what you need to protect and secure your wine.

With a team of filtration specialists on staff, we are able to assist in troubleshooting, technology transition, and product selection.

CORK & PACKAGING

Scott Laboratories is proud to be the oldest and only independently owned cork company in North America. Since 1977, this independence has been the cornerstone of our program, enabling us to protect customer interest first and foremost. With the **most stringent QC standards in the industry**, we are continually pushing for advancements in achieving the cleanest corks on the market. Our history of innovation in the cork industry dates back decades. We were the first to bring SPME testing to the industry, as well as the first to bag corks under SO₂ for protection. These practices are now the industry standard.

In addition to our **high-quality natural cork**, we are proud to offer a wide range of best-in-class packaging solutions for all your closure needs. From **screwcaps** and **micro-agglomerated cork**, to our broad sparkling portfolio of **champagne cork, wirehoods** and **crown caps**, we provide quality closures for every budget and need.

EQUIPMENT, PARTS & SERVICE

We supply a curated range of **crushpad, wine processing, and filtration equipment** from some of the leading names in the wine industry. With decades-long vendor relationships and a history of excellence, our machines are focused on improving wine quality and efficiency. From stand-alone pieces of equipment to **complete crushpad solutions**, our experienced engineers can provide guidance for a wide range of budgets and layouts.

Our **seasoned Parts & Service team** has years of experience and provides support, service and knowledge for all our equipment.

SCOTT LABORATORIES, INC

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