LALLEMAND

LALLEMAND OENOLOGY

Original *by culture*

PRODUCT CATALOG
2020 EDITION

Enological
- Yeast
- Bacteria
- Nutrients
- Specific Inactivated Yeast and Other Innovative Products

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LalVigne®
Grow your wine

MAKE YOUR WINE IN THE VINEYARD. FOLIAR VINEYARD SPRAYS FOR VARIETAL EXPRESSION.

All winegrowers face the challenge of achieving phenolic and enological maturity at the same time. Application of LalVigne® foliar sprays have resulted in improved concentration of aroma precursors, better mouthfeel and increased mature phenolic characters in the grapes and resulting wines. LalVigne® is a natural inactive yeast derivative foliar spray applied at veraison. The source yeasts used in its production were selected from the Lallemand yeast collection.

LALVIGNE MATURE® OBSERVATIONS

Uniformity in ripening

In vineyard trials, it was observed that after the LalVigne Mature® application, the vineyard seemed to color more uniformly. Below is an example of ripening uniformity with the application of LalVigne Mature®. A camera positioned in a vineyard in Spain during the 2016 harvest captured the control and treated in real time. Visit the Lallemand Oenology YouTube channel to view the LalVigne Mature® time lapse video.

Cool Region Applications—Timing of Harvest

LalVigne Mature® trial applications have resulted in some vineyards being harvested earlier than untreated vineyards. The opportunity for winemakers to achieve their harvest goals earlier greatly reduces the risk of quality and tonnage loss due to weather, bird, insect, mold or other forces that increase as the harvest wears on.

Warm Region Applications

In areas where brix levels reach their maximum before the berries have reached phenolic maturity, the application of LalVigne Mature® can bring balance to the berry. Earlier ripeness avoids high sugars, phenolic imbalance and loss of yield due to raisining and dehydration.

Skin Thickness and Extractable Anthocyanins

With the application of LalVigne Mature®, there is an effect on the berry skin thickness, and on the ratio of certain phenolic compounds, including a higher concentration of extractable anthocyanins and skin tannins.

The application of LalVigne Mature® foliar spray may result in a significant increase in berry skin thickness. The thicker skins combined with the higher extractability of these compounds results in wines with increased anthocyanins.

Reduction of green flavor compound—IBMP

It has been shown in trials from 2014–2017 that differences in methoxypyrazine levels seem to be consistently lower in the LalVigne® treated blocks compared to the control blocks.

LalVigne®
Grow your wine

LALVIGNE AROMA® OBSERVATIONS

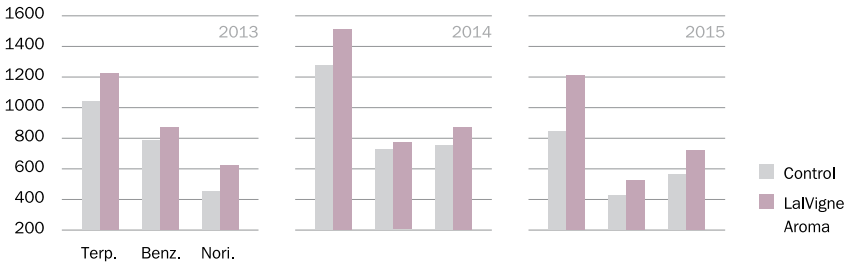
Reduced form of Glutathione (GSH)

Having high levels of GSH is important for the preservation of aroma and color. The level of glutathione can vary in must/juice based on grape varietals, viticulture and winemaking practices. For glutathione to be active and effective, it must be in its reduced form.
LalVigne Aroma® applications tend to increase the reduced form of glutathione concentrations in the grape juice and corresponding wines.

Aromatics

In LalVigne Aroma® trials run in Italy, France and the U.S., results show consistent increases in varietal aromatic compounds (higher Varietal Aroma Potential Index).
In thiolic varieties such as Sauvignon Blanc there have been higher levels of 3MH and 3MHA (passion fruit, grapefruit, guava) in wines.

Increases varietal aroma compounds
Glera (**Prosecco DOC**) Analysis of glycosides aroma precursors in grapes



Terpens
Increase of geraniol and linalol (floral and rosé) notes

Benzenoid
Notes of rose, carnation, spice

Norisoprenoids
Compounds related to exotic fruit and ripe fruit notes

LalVigne® comparison

Visit the Scott Labs YouTube channel to view the LalVigne Preparation and Application video.

	LalVigne® AROMA Grow your wine	LalVigne® MATURE Grow your wine
Advances and Increases Aroma Precursors	++++++	++
Advances and Increases Phenolic Maturity	++	++++++
Natural/Non GMO	100%	100%
Dosage	2 X 2.9 lb/acre	2 X 0.9 lb/acre
Timing of use	Beginning of veraison and 10-12 days later	Beginning of veraison and 10-12 days later

hop™

YSEO™ PROCESS

Research in collaboration with Washington State University

It becomes child's play

Selected in collaboration with INRA SCIENCE & IMPACT

LALLEMAND

LALLEMAND OENOLOGY

Original by culture

YEAST

Lallemand offers more than 100 enological yeasts throughout the winemaking world. We have selected over 40 of the most successful yeasts to meet your creative needs while working within your viticulture and winemaking practices. In North America, Lallemand's winemaking yeasts are offered under the brand names ENOFERM™, LALVIN™, UVAFERM™ and VITILEVURE™. The following brief descriptions will provide general information on each yeast and explain what sets it apart. The Yeast Chart on pages 18 and 19, and the Grape and Yeast Pairing Guide on pages 20 to 26, will help you select the right yeast to complement your grapes, fermentation conditions and stylistic goals.

CROSS EVOLUTION™

Natural cross hybrid for aromatic whites and rosés

CROSS EVOLUTION™ is a strong fermenting yeast, from the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa, that is ideal for aromatic white and rosé wines with high alcohol potential, low fermentation temperatures, and low nitrogen levels. CROSS EVOLUTION™ is not a genetically modified yeast but a result of a unique breeding program resulting in hybrids. CROSS EVOLUTION™ also complements an increased mouthfeel style resulting in aromatic wines with balanced mouthfeel. CROSS EVOLUTION™ is recommended for Chardonnay, Chenin blanc, Gewürztraminer, Pinot blanc, Pinot gris, Riesling, Roussanne, Sauvignon blanc and Viognier. Low vinylphenol production (POF-).

ENOFERM AMH™ ASSMANSHAUSEN

Allows expression of indigenous flora

Originating from the Geisenheim Research Institute, ENOFERM AMH™ is a favorite for making Riesling, Pinot noir and Zinfandel. It is considered a color-friendly yeast that complements spicy (clove, nutmeg) and fruit flavors and aromas, as well as positive, smooth mouthfeel to the overall complexity. AMH™ has a long lag phase and a slow to medium fermentation rate. Therefore, a well-managed nutrient program during rehydration and fermentation is essential. Good ferment domination is obtained with AMH™ if the culture is allowed to develop in about 10% of the total must volume for 8 hours before final inoculation. Very malolactic bacteria compatible. It is classified as a *Saccharomyces kudriavzevii*

YEAST

ENOFERM CSM™

To reduce herbaceous character in under-ripe fruit

ENOFERM CSM™ was isolated from Bordeaux for Cabernet sauvignon, Cabernet franc and Merlot. It does not tolerate alcohols above 14% and benefits from high and balanced nutrient additions under good fermentation practices. It favors color and phenolic extraction, and complements red fruit-driven complexity along with balanced, round mouthfeel. CSM™ will encourage malolactic fermentation. Low vinylphenol production (POF-).

ENOFERM M1™

For sweet-style aromatic whites and rosés

ENOFERM M1™ is from the culture collection at Massey University, New Zealand. It is used to produce aromatic rosé and white wines, especially wines with residual sugar. Due to the high production of esters, it complements fruit-driven wines, especially when fermented at lower temperatures and provided with adequate balanced nutrients. The production of esters is limited at temperatures above 20°C (68°F). The yeast flocculates and settles to give compact lees. Not malolactic bacteria compatible. The ENOFERM M1™ does not produce H_2S.

ENOFERM RP15™

Rockpile selection for concentrated reds

ENOFERM RP15™ was isolated and selected from spontaneous Rockpile Syrah fermentations. This California isolate is used in concentrated reds, particularly Syrah, Zinfandel, Cabernet sauvignon and Merlot where a moderate fermentation rate is desired for rich, lush, balanced mouthfeel and full bodied wines. RP15™ has a moderate nitrogen demand, and will allow good results with varietal flavor, and red fruit and mineral aromatic note development, when carefully rehydrated using GO-FERM PROTECT EVOLUTION™ before inoculation into musts.

ENOFERM SYRAH™

For classical Syrah aromas

ENOFERM SYRAH™ is a Côtes du Rhône isolate used for Syrah, Merlot and Carignan. It is a high glycerol producer and complements good mouthfeel and stable color extraction. It requires high nutrient levels and shows the best sensory results when a proper nutrition strategy is followed, complementing Syrah styles having violet, raspberry, cassis, strawberry, black pepper and grilled meat notes.

ENOFERM T306™

For elegant aromatic whites

ENOFERM T306™ was isolated from indigenous fermentations of Pinot noir at Tyrrell's Vineyards, Pokolbin, in the Hunter Valley, NSW Australia. It is used mainly for fruit-focused Pinot gris, Chardonnay, Semillon and Chenin blanc, complementing their aroma characters of exotic tropical fruit and pineapple. In barrel-fermented Chardonnay, it contributes elegant white fruit and mouthfeel, particularly with lees contact time.

YEAST

HOP™

Optimized fermentation stress resistance

NEW HOP™ is an innovative yeast selected by Lallemand and the INRA Montpellier in France with a unique genetic background, which delivers reliable fermentations under highly stressful winemaking conditions. Especially adapted to wineries managing large fermenters, HOP™ resists high sugar and SO_2 levels even under limited vitamin availability. When inoculated without prior rehydration, HOP™ shows strong fermentative properties allowing a quick onset of fermentation, helping to avoid the development of potential spoilage organisms in white, rosé and red wines.

IONYS$_{WF}$™

For acidity and balance in reds

IONYS$_{WF}$™ is a selected wine yeast naturally increasing the acidity perception of wines fermented from low acid musts resulting in more balanced wines. The IONYS$_{WF}$™ selection was done in collaboration with INRA Montpellier, France and is protected by an International Patent pending; No WO2015/11411. Propagation of IONYS$_{WF}$™ is an infringement of this Patent. IONYS$_{WF}$™ is recommended for fermenting red musts from warmer climates with high pH and potential alcohol. In red ferments it is suggested to maintain ferment temperature in the range 25-28°C (77-82°F) for higher production of glycerol and an optimal decrease in ethanol content.

LALVIN 71B™

For nouveau wines

LALVIN 71B™ was isolated by the INRA (National Agricultural Research Institute) in Narbonne, France; 71B™ is used for making blush and semi-sweet wines with tropical fruit character. Long-lived aromas are due to its production of relatively stable esters and higher alcohol levels; 71B™ also softens high-acid musts by partially metabolizing malic acid. Very malolactic-bacteria compatible.

LALVIN BA11™

Secure yeast for white wine mouthfeel

LALVIN BA11™ was selected in 1997 near Estação Vitivinicola de Barraida in Portugal. It has excellent fermentation kinetics, even at low temperatures. It complements fresh aromatic characteristics, and intensifies mouthfeel and lingering flavors in whites, such as Pinot gris. In relatively neutral white varieties, BA11™ complements white wines showing fresh fruit aromas of orange blossom, pineapple and apricot.

YEAST

LALVIN BM45™

The big movement in winemaking

LALVIN BM45™ was isolated in the early 1990s in collaboration with the Consorzio del Vino Brunello de Montalcino and the University of Siena. BM45™ is a relatively slow starter and is well suited for long maceration programs. It has high nitrogen requirements and can produce sulfides if nutrient starved. When used in whites, BM45™ benefits greatly from rehydration with proper nutrition. During fermentation, BM45™ produces high levels of polyphenol-reactive polysaccharides, complementing wines with great mouthfeel and improved color stability. BM45™ is used on red varieties to complement jam, spice and earthy wine styles. It is also used to minimize vegetal characteristics. Some winemakers use BM45™ on Chardonnay as a blending component to increase mouthfeel. Not malolactic bacteria compatible.

LALVIN BM 4X4™

The attributes of LALVIN BM45™ with optimized fermentation capacity

LALVIN BM 4X4™ is a blend of LALVIN BM45™ and another yeast known for its fermentation reliability. BM45™ is known and appreciated around the world for its round mouthfeel and stable color (see above description for BM45™). However, BM45™ is a slow fermenter and can require substantial nutrients to complete fermentation successfully, and without the production of sulfides. While BM45™ has a very strong following among winemakers who enjoy its slow fermentation and its suitability for long maceration programs, there are others who desire the attributes of BM45™ but with a more timely and secure fermentation. BM 4X4™ achieves this goal.

During the yeast growth phase, BM 4X4™ has the unusual capacity of releasing a significant quantity of polyphenol-reactive polysaccharides into the fermenting must. The quantity and the quality of the polysaccharides released during fermentation facilitate the production of red wines with great mouthfeel and improved color stability, with dependable fermentation kinetics under difficult fermentation conditions. In whites, BM 4X4™ releases a high level of esters responsible for fruit aromas and also brings roundness to the mouthfeel. Not malolactic bacteria compatible.

LALVIN BRL97™

For long aging, color stability and structure

LALVIN BRL97™ was selected as a result of a four-year study by the University of Torino from over 600 isolates taken from 31 wineries in the Barolo region. The goal was to find a selected natural yeast from Nebbiolo that is able to retain both the color and the varietal character of this grape. BRL97™ has received good feedback from North American winemakers for its color stabilization and sensory contributions in heavier structured reds, such as Zinfandel, Barbera, Merlot and Nebbiolo, with long aging potential.

YEAST

LALVIN CLOS™

For ultra-premium red wines

LALVIN CLOS™ was selected by the University of Rovira i Virgili in Spain from the Priorat region, situated in the province of Tarragona. Vinification trials show LALVIN CLOS™ has a very good implantation rate under difficult conditions, such as low nitrogen content over a wide range of temperatures. The results of experimental and winery trials with Carignan, Grenache, Syrah, Zinfandel and Tempranillo grapes confirm this yeast's potential as an excellent tool to complement aromatic complexity, structure and mouthfeel. Very malolactic-bacteria compatible.

LALVIN CY3079 (BOURGOBLANC)™

For classic white Burgundy

LALVIN CY3079™ was selected by the BIVB with the objective of finding a yeast that would complement typical white Burgundy styles. CY3079™ is a steady, average fermenter, especially at cold temperatures 13°C(55°F). Its fermentation finish is slow due to an early autolysis resulting in roundness. This yeast greatly benefits from using rehydration nutrients and complex yeast nutrients designed for use during fermentation. When properly fed, CY3079™ has good alcohol tolerance (up to 15%) and is a low producer of volatile acidity and sulfides. It is recommended for barrel-fermented Chardonnay and *sur lie* aging. CY3079™ complements Chardonnay styles described as rich, having full mouthfeel and characterized by aromas of fresh butter, almond, honey, white flowers and pineapple.

LALVIN DV10™

Epernay selection for primary and secondary fermentation

LALVIN DV10™ was selected in the Epernay region and is approved by the CIVC in Epernay. DV10™ has strong fermentation kinetics over a wide temperature range and relatively low nitrogen demands. DV10™ is famous for its ability to ferment under stressful conditions of low pH, high total SO_2 and low temperature. Low foaming and low volatile acidity production characterize it. DV10™ is considered a clean fermenter that respects varietal character and avoids the harsh sensory contributions of other one-dimensional "workhorse" yeasts, such as Prise de Mousse. Excellent results in cider. It is classified as a *Saccharomyces cerevisiae bayanus*.

LALVIN EC1118™

The original Prise de Mousse

LALVIN EC1118™ is the original and is good for barrel fermentations. It ferments well at low temperatures and flocculates well with very compact lees. Under low nutrient conditions, EC1118™ produces a lot of SO_2 (up to 30 ppm) and as a result can inhibit malolactic fermentation. It is classified as a *Saccharomyces cerevisiae bayanus*.

YEAST

LALVIN ICV D21™

The *terroir* yeast

LALVIN ICV D21™ was isolated in 1999 from the Pic Saint Loup Languedoc *terroir* during a special regional program run by the Institut Coopératif du Vin (ICV) natural micro-flora observatory and conservatory. ICV D21™ was selected for fermenting red wines with stable color, intense fore-mouth, mid-palate tannin structure, and fresh aftertaste. Unlike most wine yeasts, ICV D21™ contributes both higher acidity perception and positive polyphenol-reactive polysaccharides. Strong interactions of the polysaccharides with the floral and fruity volatile compounds contribute to a more stable aromatic profile in the mouth. These attributes avoid the development of cooked jam and burning alcohol sensations in highly mature and concentrated Cabernet sauvignon, Merlot and Syrah. During fermentation, ICV D21™ produces very few sulfides, and it is also noted for its good fermentation performance, even under high temperature and low nutrient conditions. It allows for the expression of fruit from the grapes while reducing the potential for herbaceous characters in Cabernet sauvignon.

LALVIN ICV D47™

For complex whites with citrus and floral notes

LALVIN ICV D47™ is a Côtes du Rhône isolate from Suze-la-Rousse for the production of full-bodied barrel-fermented Chardonnay and other white varietals. When left on lees, ripe spicy aromas with tropical and citrus notes can be stabilized. ICV D47™ is a high polysaccharide producer known for complementing fruit and great volume. On most white grape varieties, this yeast complements wine styles with ripe stable fruit or jam-like aromas. The *cuvées* fermented with the ICV D47™ are a good source of complexity in the blends. Moreover, ICV D47™ complements wine's silkiness and persistence. Excellent results are obtained for the production of top-of-the-range Chardonnay fermented in barrels, especially when blended with LALVIN ICV D21™ fermented Chardonnays. Very malolactic-bacteria compatible.

LALVIN ICV D80™

To enhance tannin structure

LALVIN ICV D80™ was isolated by Dominique Delteil of the ICV in 1992 from the Côte Rôtie area of the Rhône Valley for its ability to ferment musts high in sugar and polyphenols. With proper nutrition, aeration and fermentation temperatures below 28°C (82°F), ICV D80™ will ferment up to 16% alcohol. ICV D80™ brings high fore-mouth volume, big mid-palate mouthfeel and intense fine-grain tannin to reds. It is one of the best strains for complementing big tannin volume, ripe fruit, smoke and licorice style reds. When blended with wines fermented with LALVIN ICV D254™ or Syrah, wines fermented with ICV D80™ bring more tannin intensity to the blend.

YEAST

LALVIN ICV D254™

For mouthfeel in Mediterranean-style reds

LALVIN ICV D254™ was selected by the ICV in 1998 from Syrah fermentations in Gallician, south of the Rhône Valley. ICV D254™ complements red wine styles with high fore-mouth volume, big mid-palate mouthfeel, intense fruit concentration, smooth tannins and a mildly spicy finish. Red wines made with ICV D254™ may be blended with LALVIN ICV D80™ or ICV D21™ to create more concentrated, full-bodied wines. In unripe reds, ferment 25% to 50% of the lot with ICV D254™ and the balance with LALVIN ICV GRE™ to help mask vegetative character. As a complement to LALVIN CY3079™, winemakers use ICV D254™ for fermenting Chardonnay styles with nutty aromas and creamy mouthfeel. Very malolactic-bacteria compatible.

LALVIN ICV GRE™

For fruit-forward Rhône-style wines

In 1992, LALVIN ICV GRE™ was selected from the Cornas area of the Rhône Valley. In reds, it complements up-front fruit to easy-to-drink Rhône-style wines. ICV GRE™ is used with short skin contact regimes (3 to 5 days) to reduce vegetal and undesirable sulfur components in varieties like Merlot, Cabernet sauvignon, Grenache and SYRAH. In fruit-focused whites like Chenin blanc, Riesling and Viognier, ICV GRE™ complements stable fresh-fruit characteristics and big fore-mouth impact. If the fruit maturity is less than optimum, ICV GRE™ is excellent for bringing overall balance to red, rosé and white wines. Rosé wines fermented with ICV GRE™ from more balanced maturity fruit are complemented by blending rosés fermented with LALVIN ICV D21™. Very malolactic-bacteria compatible.

LALVIN MSB™

Compliments Sauvignon blanc varietal character

NEW LALVIN MSBT™ yeast was isolated from Marlborough Valley in New Zealand by the Lallemand R&D team. LALVIN MSB™ was specifically selected from several isolates for its fermentation performance and ability to compliment Sauvignon blanc varietal character with fruity, tropical and citrus notes. Varietal characters are accompanied with excellent fruity thiol production and balanced mouthfeel by LALVIN MSB™.

LALVIN ICV OKAY™

Sulfur compound management of fruity esters style Rosé de Provence

LALVIN ICV OKAY™ is the result of a collaboration between the scientific Institut Coopératif du Vin (ICV) group, Lallemand, Sup'Agro and the INRA Montpellier. The innovation is based on successive backcrosses of an excellent fermenting wine yeast and a yeast with very low production of sulfur compounds such as H_2S. The resulting LALVIN ICV OKAY™ yeast combines reliable fermentation performance and no production of SO_2, H_2S and acetaldehyde. Very malolactic-bacteria compatible.

YEAST

LALVIN ICV OPALE 2.0™

Sulfur compound management of thiolic style Rosé de Provence

This is the latest natural yeast selection from the Institut Coopératif du Vin (ICV). When compared with other yeasts, the LALVIN ICV OPALE 2.0™ complements intense and complex fruit aromas in premium white and rosé wines. This yeast also shows good fermentation abilities in the high-maturity grapes coming from the Mediterranean and Rhône regions. Wines fermented with ICV OPALE 2.0™ give the initial impression of volume and softness, followed by a round, intense mid-palate and balanced finish. Not malolactic-bacteria compatible. Very low production of SO_2, H_2S, vinylphenol (POF-) and acetaldehyde.

LALVIN PERSY™

For sulfur compound management in reds

NEW In collaboration with the INRA and SupAgro Montpellier, France, Lallemand have selected LALVIN PERSY™ yeast for its ability to avoid SO_2 and H_2S production while exhibiting excellent fermentation performance and alcohol tolerance. LALVIN PERSY™ reliably ferments red varieties such as Syrah, Tempranillo and Pinot noir, complementing their varietal character, freshness and aroma persistency. Good compatibility with malolactic-bacteria.

LALVIN QA23™

Successfully ferments highly clarified must

LALVIN QA23™ was selected in Portugal by the University of Trás-os-Montes and Alto Douro (UTAD) in cooperation with the Viticultural Commission of the Vinhos Verdes region. It is used for Chardonnay, Sauvignon blanc, Chenin blanc, Colombard and Semillon for the production of crisp and fresh-fruit intense wines. It enhances aromas of terpenic varietals through its beta-glucosidase activity and is an excellent thiol converter, making it a complementary yeast for developing varietal Sauvignon blanc passionfruit character. QA23™ has low nutrient and oxygen requirements and will ferment juice with low turbidity at low temperatures (10°C) to dryness. It is classified as a *Saccharomyces cerevisiae bayanus*. Very malolactic-bacteria compatible.

LALVIN R2™

For the expression of Sauvignon blanc aromas

LALVIN R2™ was isolated in the Sauternes region of Bordeaux by Brian Croser of South Australia. It has excellent cold temperature properties and will ferment as low as 5°C (41°F). Without good nutrition and protection against osmotic shock, it can tend to produce volatile acidity. For this reason, proper nutrition and protection during rehydration and during fermentation is recommended. R2™ helps produce intense, direct fruit-style whites by liberating fruit and floral aroma precursors. It is recommended for aromatic white varieties, such as Sauvignon blanc, Riesling and Gewürztraminer. It is classified as a *Saccharomyces cerevisiae bayanus*.

YEAST

LALVIN RC212 (BOURGOROUGE)™

For Pinot noir with color and structure

LALVIN RC212™ was selected from fermentations in Burgundy by the BIVB to extract and protect the polyphenols of Pinot noir. Due to the limited adsorption of polyphenols on RC212™ yeast cell walls, there is limited color loss and structure is protected during aging. It requires high nutrient additions to avoid the potential development of sulfides, and demonstrates best results when rehydrated with the right nutrient and protectant. RC212™ consistently produces Pinot noir with good structure, ripe cherry, bright fruit and spicy characteristics. Wines made with RC212™ can be blended with wines made with LALVIN RA17™ to achieve more complexity and finesse.

LALVIN RHÔNE 2226™

Excellent alcohol tolerance

LALVIN RHÔNE 2226™ is a vineyard isolate from Côtes du Rhône. It is very alcohol tolerant and highly recommended for high-sugar reds and late-harvest wines. In red varietals, high color and good structure, as well as black cherry, berry and cherry cola aromas characterize RHÔNE 2226™.

LALVIN RHÔNE 4600™

Aromatic and elegant whites and rosés

LALVIN RHÔNE 4600™ was selected from Viognier by the Inter-Rhône technical department after a three-year study of yeast well suited for fermenting fruit-forward, elegant white and rosé wines. High-sugar and low-nitrogen musts, when fermented cool (13.5°C-56°F) with RHÔNE 4600™, have enhanced apricot and tropical fruit due to strong fatty-acid ethyl-ester production. Higher roundness with diminished bitterness also makes the RHÔNE 4600™ a good choice for Rhône white varietals and Chardonnay. Although the RHÔNE 4600™ does not enhance the varietal character of Sauvignon blanc or Semillon, this yeast does bring fatness and balance along with light aromatic ester notes as a good blending component. Very malolactic-bacteria compatible.

LALVIN R-HST™

For Riesling and other aromatic whites

LALVIN R-HST™ was selected for its exceptional enological properties in Riesling from trials conducted from 1991 to 1996 in the Heiligenstein region of Austria. R-HST™ has a short lag phase and generation time, even at cold temperatures. These features allow it to dominate and persist over spoilage yeast, such as *Kloeckera apiculata*. R-HST™ retains fresh varietal character and emphasizes floral (rose) and mineral characteristics, while contributing body and mouthfeel for an overall complexity and elegance. R-HST™ also produces crisp, premium white and Pinot noir wines that develop well over time.

YEAST

LALVIN SENSY™

For sulfur compound management

In collaboration with the INRA and SupAgro Montpellier, France, Lallemand have selected LALVIN SENSY™ yeast for its special abilities to produce very low SO_2 and H_2S while completing alcoholic fermentation even under low temperature and NTU white winemaking conditions. In low nutrient juices, avoid adding >50 ppm SO_2 at the crusher. SENSY™ is recommended for aromatic white and rosé wines, ensuring low levels of volatile acidity, promoting intense aromatic esters and bringing freshness and balance in the mouth.

LALVIN T73™

Security for high-alcohol reds

LALVIN T73™ was isolated from the València area in Spain, and was selected for its ability to enhance the natural aromas and flavors of red wines produced in hot climates. Due to its ability to produce high quantities of glycerol, wines made from T73™ have good mouthfeel. Hot-climate reds that have problems "opening up" are enhanced by the well-balanced production of esters and higher alcohols. T73™ has an extremely low nitrogen demand and quickly dominates the must's indigenous microflora. It also exhibits good resistance to vineyard antifungal treatments. T73™ is classified as a *Saccharomyces cerevisiae bayanus*.

LALVIN TANGO MALBEC™

Yeast selection from Argentina Malbec

Isolated by the National Institute of Agricultural Technology (INTA) in La Consulta area (Uco Valley, Mendoza, Argentina) from Malbec fermentations. Lalvin Tango Malbec™ has good fermentative properties, and helps bring forward varietal fruit character, as well as impacting mouth structure and balance.

LALVIN W15™

For clean, low-temperature ferments

LALVIN W15™ was isolated in 1991 from a high-quality Müller Thurgau must at the Viticulture Research Station in Wädenswil, Switzerland. W15™ was developed to ferment dry white and red wines at moderate speeds, where bright fruit and good structure are desired, due to the production of higher levels of glycerol and succinic acid. Very little heat is generated by W15™ during fermentation, reducing the potential for the formation of sulfide aromas, and good osmotic tolerance has been noted for late harvest fermentations and icewine. Very malolactic-bacteria compatible.

YEAST

SAUVY™

For optimal expression of thiols

NEW A new Lallemand yeast selected for its unique metabolism and enzymatic activities resulting in the high potential to uptake and release volatile thiols, especially 4MMP. SAUVY™ is well suited for the production of intense and fresh aromatic white wines. Varietals such as Sauvignon blanc fermented with SAUVY™ show typical flavor profiles described as boxwood, gooseberry, passion fruit, citrus and black currant. SAUVY™ also favors refreshing and crisp mouthfeel sensation.

UVAFERM 43 RESTART ™

The fructophilic yeast to rescue stuck fermentations

Selected for its exceptional ability to restart stuck fermentations, UVAFERM 43™ was chosen from among 33 different isolates that were tested against each other, and from the traditional yeasts typically used to restart stuck fermentations. The 43™ yeast is one of the most fructophilic yeast and is now also available in a pre-conditioned reliable restart form. It is classified as a *Saccharomyces cerevisiae bayanus*. Very malolactic-bacteria compatible.

UVAFERM BDX™

The perfect fermenter

A French isolate used extensively in California and Australia since the late 1980s, UVAFERM BDX™ has perfect fermentation kinetics and does not generate a lot of heat during fermentation. It is highly recommended for producing of quality red wines, especially Merlot and Cabernet sauvignon, with minimum color loss and enhanced flavor and aroma.

UVAFERM VRB™

Balanced mouthfeel in high-alcohol reds

UVAFERM VRB™ was chosen by the CIDA in the Rioja region of Spain to complement varietal characteristics and ester perception. When fermented with VRB™, red wines, such as Tempranillo, Barbera and Sangiovese, tend to have good color intensity and stability with increased phenolic structure, as well as complement ripe fruit, jam, hazelnut and dried plum styles. With properly integrated nutrition, VRB™ has a high alcohol tolerance (up to 17%), a short lag phase, steady fermentation rate and low volatile acidity production. Low vinylphenol production (POF-). Very malolactic-bacteria compatible.

YEAST

VITILEVURE 3001™

For Pinot noir

VITILEVURE 3001™ was isolated, studied and selected from the prestigious Côte de Nuits terroir in Burgundy during a three-year research project by Laboratory Burgundia Œnologie in Beaune, France. The goal of this selection program was to find dominant natural yeast that would complement intense, complex and balanced Pinot noir varietal character. VITILEVURE 3001 yeast is recommended for cold soak as it tolerates SO_2 and low temperatures. Very malolactic-bacteria compatible.

VITILEVURE 58W3™

For Alsatian-style aromatic whites

VITILEVURE 58W3™ was isolated, studied and selected during a five-year research project by the INRA in Colmar (Alsace), France, in collaboration with Gresser Oenology. The goal of this selection program was to find a dominant natural yeast that would complement spicy, floral and fruit descriptors in aromatic white varietals, such as Gewürztraminer and Pinot gris. Unique to 58W3™ is its ability to complement an overall well-balanced mouthfeel and minimize the development of bitter compounds associated with more basic "workhorse" yeasts. Due to its fermentation kinetics, especially in high potential alcohol juices, a balanced nutrient strategy and good fermentation practices should be followed.

VITILEVURE ELIXIR™

For aromatic expression in white and rosé wines

A natural cross-hybrid from the Institute for Wine Biotechnology at the University of Stellenbosch in South Africa, VITILEVURE ELIXIR™ was selected for its strong fermentation characteristics, while complementing terpenes, thiols and floral, fruity aromas from fatty-acid esters, for lasting elegance and finesse. Recommended for Sauvignon blanc, Chardonnay, Gewürztraminer, Riesling, Muscat, Chenin blanc and Ugni blanc, as well as rosés, especially from Cabernet, Grenache and Syrah.

VITILEVURE M83™

Rosé de Provence with mouthfeel and balance

VITILEVURE M83™ is the outcome of a yeast selection program by the Laboratoire Aubanelle in the Bandol appellation of the Provence region. It complements round and balanced rosés with enhanced fruit aromas and more stable color, due to its polyphenol-reactive polysaccharides. M83™ is a low SO_2 and low volatile acidity yeast with very good fermentation kinetics up to 15.5% alcohol. Tastings by Bandol region professionals at the Centre de Recherche et d'Expérimentation sur le Vin Rosé confirmed that M83™ was well adapted to the difficult fermentation conditions encountered in Provence.

YEAST

VITILEVURE MT™

For long-aging Bordeaux varieties

VITILEVURE MT™ was selected in Saint Emilion by the ITV Bordeaux in collaboration with the INRA Montpellier, to help complement the typical strawberry jam and caramel aromatics of Merlot. The color intensity and tannic structure of wines produced with MT™ are higher when compared with standard yeasts used for Bordeaux red varietals. This yeast is particularly recommended for grapes with high maturity and long aging potential. The fermentation kinetics of MT™ are steady and its alcohol tolerance is high. However, it will benefit from a balanced nutrient strategy, especially in low nutrient musts with high potential alcohol. Very malolactic-bacteria compatible.

VITILEVURE QUARTZ™

For sparkling wines, secure fermentation and aromatic finesse

VITILEVURE QUARTZ™ was isolated from the Fleury domain at Courteron in the Aube region, where biodynamics have been practiced since the 1980s. With an alcohol tolerance of up to 17%, as well as low temperature and pH tolerance, QUARTZ™ is suited to difficult conditions. Aside from being a good choice for sparkling wines, it is a great selection for tank-fermented Sauvignon blanc or whites fermented in neutral barrels. It is also recommended for restarting stuck fermentations. QUARTZ™ is a *Saccharomyces cerevisiae bayanus*.

Healthy yeasts begin their lives at Lallemand!
Yeast SEcurity and Optimization
Lallemand's proprietary process to produce naturally selected yeasts from the growth phase to the drying phase results in yeasts that are better adapted to current winemaking practices. The YSEO process was validated with the cooperation of the Washington State University.

YEAST CHART

Yeast	Whites	Rosés	Reds	Late-harvest	Restart Stuck	Sensory Effect	Temp. Range	Ferm. Speed	Competitive Factor	Alcohol Tolerance	Relative Nitrogen Needs
CROSS EVOLUTION™	4	4	1	1	1	CVC	14-20°C/57-68°F	moderate	active	15	low
ENOFERM AMH™	2	1	4	1	1	CVC	20-30°C/68-86°F	slow	sensitive	15	medium
ENOFERM CSM™	1	1	4	1	1	CVC	15-32°C/59-90°F	moderate	active	14	medium
ENOFERM M1™	4	2	1	2	1	esters	15-20°C/59-68°F	slow	sensitive	16	high
ENOFERM RP15™	1	1	4	1	2	CVC	20-30°C/68-86°F	moderate	active	17	medium
ENOFERM SYRAH™	1	2	4	1	1	CVC	15-32°C/59-90°F	moderate	active	16	medium
ENOFERM T306™	4	2	2	1	1	CVC	15-30°C/59-86°F	moderate	active	14	high
HOP™	3	3	3	3	2	neutral	14-30°C/57-86°F	fast	sensitive	16	low
IONYS$_{WF}$™	2	2	4	1	1	CVC	20-28°C/68-82°F	moderate	active	16	high
LALVIN 71B™	3	4	4	2	1	esters	15-30°C/57-68°F	moderate	sensitive	14	low
LALVIN BA11™	4	3	1	2	1	esters	15-25°C/59-77°F	moderate	sensitive	16	high
LALVIN BM45™	2	1	4	1	1	CVC	18-28°C/64-82°F	moderate	active	15	high
LALVIN BM 4X4™	4	1	4	1	1	CVC	18-28°C/64-82°F	moderate	active	16	high
LALVIN BRL97™	1	1	4	1	1	CVC	17-29°C/63-84°F	moderate	active	16	medium
LALVIN CLOS™	1	2	4	1	1	CVC	13-35°C/55-95°F	fast	active	17	medium
LALVIN CY3079™	4	2	1	1	1	CVC	15-25°C/59-77°F	moderate	sensitive	15	high
LALVIN DV10™	4	2	4	4	3	neutral	10-35°C/50-95°F	fast	active	18	low
LALVIN EC1118™	3	2	2	3	3	neutral	10-30°C/50-86°F	fast	active	18	low
LALVIN ICV D21™	3	2	4	1	1	CVC	16-30°C/60-86°F	moderate	active	16	medium
LALVIN ICV D47™	4	4	2	1	1	CVC	15-28°C/59-82°F	moderate	active	15	low
LALVIN ICV D80™	1	1	4	1	1	CVC	15-28°C/59-82°F	moderate	active	16	medium
LALVIN ICV D254™	4	1	4	1	1	CVC	15-28°C/59-82°F	moderate	neutral	16	medium
LALVIN ICV GRE™	4	4	4	1	1	CVC	15-28°C/59-82°F	moderate	active	15	medium
LALVIN ICV OKAY™	4	4	2	3	3	CVC	12-30°C/54-86°F	fast	active	16	low
LALVIN ICV OPALE 2.0™	4	4	1	1	1	CVC	12-28°C/54-82°F	medium	active	14	low
LALVIN MSB™	4	3	1	1	1	CVC	14-20°C/57-68°F	moderate	active	14	medium

LALVIN PERSY™	2	2	4	1	1	CVC	15-28°C/59-82°F	moderate	active	16	low
LALVIN QA23™	4	1	1	3	3	CVC	14-28°C/57-82°F	fast	active	16	low
LALVIN R2	4	3	1	4	3	esters	10-30°C/50-86°F	moderate	active	16	medium
LALVIN RC 212™	1	1	4	1	1	CVC	18-30°C/64-86°F	moderate	neutral	16	medium
LALVIN RHÔNE 2226™	2	2	4	4	3	CVC	15-28°C/59-82°F	fast	active	18	high
LALVIN RHÔNE 4600™	4	4	2	2	1	esters	13-22°C/55-72°F	moderate	active	15	low
LALVIN R-HST™	4	1	1	1	1	neutral	10-30°C/50-86°F	moderate	active	15	medium
LALVIN SENSY™	4	4	2	1	1	CVC	12-18°C/54-64°F	moderate	active	15	low
LALVIN T73™	1	1	4	1	1	esters	18-35°C/64-95°F	moderate	active	16	low
LALVIN TANGO™	1	1	4	1	1	CVC	15-28°C/59-82°F	moderate	neutral	16	medium
LALVIN W15™	4	4	3	3	1	CVC	12-27°C/54-80°F	moderate	active	16	high
SAUVY™	4	3	1	1	1	CVC	13-20°C/55-68°F	moderate	active	14	medium
UVAFERM 43™	2	1	3	3	4	neutral	13-35°C/55-95°F	fast	active	18+	low
UVAFERM BDX™	1	1	4	1	1	CVC	18-30°C/64-86°F	moderate	sensitive	16	medium
UVAFERM VRB™	1	2	4	1	1	CVC	15-28°C/59-82°F	moderate	neutral	17	medium
VITILEVURE 3001™	1	1	4	1	1	CVC	10-32°C/50-90°F	moderate	active	15	medium
VITILEVURE 58W3™	4	1	1	1	1	CVC	12-25°C/54-77°F	moderate	neutral	14	medium
VITILEVURE ELIXIR™	4	4	1	1	1	CVC	14-25°C/57-77°F	moderate	neutral	15	medium
VITILEVURE M83™	2	4	4	1	1	CVC	17-28°C/63-82°F	moderate	neutral	15	medium
VITILEVURE MT™	1	2	4	1	1	CVC	15-32°C/59-90°F	moderate	active	15	medium
VITILEVURE QUARTZ™	4	1	1	1	3	CVC	10-32°C/50-90°F	fast	sensitive	17	low

This chart is meant to help you conquer the challenge of choosing the right yeast for every fermentation. The data in the chart is intended only as a quick reference guide. Please refer to the Yeast description and the Grape and Yeast Pairing Guide for additional technical information. For specific questions please contact your Lallemand representative or distributor. **Some notes:**

- Highest rating: 4, lowest rating: 1.
- Please note that the "temperature range" column does not indicate the "optimum temperature range."
- Keep in mind that a yeast's ability to ferment within the given temperature range will depend on the alcohol potential and other antagonistic conditions.
- The "relative nitrogen requirement" refers to how much nitrogen a yeast requires relative to the other yeasts on the chart under nitrogen-limiting conditions.
- CVC = Complements Varietal Character.

GRAPE AND YEAST PAIRINGS

You can't make good wine from bad grapes! The inherent quality of the fruit can account for most of a wine's quality, but the remaining quality contribution is directly related to winemaking. The yeast, and its ability to marry all aspects of the grape during fermentation, plays a significant role.

We have created this grape and yeast pairing guide to help you select the best yeast for your stylistic goals and given conditions. The yeasts are grouped under the descriptors or characteristics they will typically contribute under normal winemaking conditions in different varieties. For example, if you would like to accentuate the stone fruit character in Chardonnay, we recommend selecting LALVIN ICV D47™ or LALVIN ICV D254™. In our experience, these yeasts express more stone fruit than yeasts such as LALVIN CY3079 BOURGOBLANC™ or ENOFERM T306™.

As always, this is just a guide and only one part of the story. For more information on the yeasts, refer to the Yeasts section and Yeast Chart. Of course, if you still have questions, email us and we will get right back to you!

Cabernet franc

Berry	Plum	Spice	Color Stability	Rosé Style
ENOFERM CSM **LALVIN** ICV D21 ICV GRE PERSY RC212 T73 **UVAFERM** VRB **VITILEVURE** MT	**LALVIN** BM45 BM 4X4 BRL97 ICV D80 ICV D254 PERSY **UVAFERM** VRB BDX	**ENOFERM** CSM RP15 **LALVIN** ICV D80	**ENOFERM** CSM RP15 **LALVIN** BM45 BM 4X4 BRL97 ICV D254 RC212 **UVAFERM** BDX VRB **VITILEVURE** MT	**LALVIN** 71B ICV D21 ICV GRE RHÔNE 4600 **VITILEVURE** M83 MT

Cabernet sauvignon

Berry	Jam	Color Stability	Round Mouthfeel	Ageable Tannins
ENOFERM CSM RP15 **LALVIN** CLOS ICV D21 ICV D254 ICV GRE RHÔNE 2226 **UVAFERM** BDX VRB	**LALVIN** BM45 BM 4X4 BRL97 ICV D254 T73 **UVAFERM** BDX VRB	**ENOFERM** CSM RP15 **LALVIN** BM45 BM 4X4 BRL97 CLOS ICV D254 RHÔNE 2226 **UVAFERM** BDX VRB	**ENOFERM** RP15 **LALVIN** BM45 BM 4X4 CLOS ICV D254 **LEVEL2** BIODIVA **UVAFERM** BDX VRB	**ENOFERM** RP15 **LALVIN** CLOS DV10 ICV D21 ICV D80 RHÔNE 2226 T73

GRAPE AND YEAST PAIRINGS

Chardonnay

White Fruit	Stone Fruit	Citrus	Nuts	Volume
ENOFERM T306 **LALVIN** CY3079 ICV D21 ICV OPALE 2.0 QA23 **LEVEL2** BIODIVA	**LALVIN** ICV D47 ICV D254 ICV OPALE 2.0	**LALVIN** DV10 ICV D47 ICV OPALE 2.0 **VITILEVURE** QUARTZ ELIXIR	**LALVIN** CY3079 ICV D47 ICV D254	**CROSS EVOLUTION** **ENOFERM** T306 **LALVIN** BM 4X4 CY3079 ICV D21 ICV D47 ICV D254 ICV OPALE 2.0 **LEVEL2** BIODIVA

Gewürztraminer

Spice	Flint Stone/ Mineral	Rose	Citrus
LALVIN DV10 QA23 R2 W15 **LEVEL2** BIODIVA **VITILEVURE** 58W3 QUARTZ	**LALVIN** BA11 ICV D47 ICV GRE ICV OPALE 2.0 R2 SENSY **VITILEVURE** QUARTZ	**CROSS EVOLUTION** **LALVIN** 71B BA11 ICV D47 W15 **VITILEVURE** 58W3	**LALVIN** DV10 ICV GRE ICV OPALE 2.0 QA23 W15 **VITILEVURE** QUARTZ ELIXIR

Grenache

Berry	Plum	Spice	Color Stability	Rosé Style
ENOFERM CSM SYRAH **LALVIN** CLOS ICV GRE PERSY RC212 T73 **UVAFERM** VRB **VITILEVURE** MT	**LALVIN** BM45 BM 4X4 BRL97 ICV D254 ICV D80 PERSY **UVAFERM** BDX VRB	**ENOFERM** CSM RP15 SYRAH **LALVIN** ICV D80 PERSY	**ENOFERM** CSM RP15 **LALVIN** BM45 BM 4X4 BRL97 CLOS ICV D254 **UVAFERM** BDX VRB **VITILEVURE** MT	**LALVIN** 71B ICV GRE ICV OPALE 2.0 RHÔNE 4600 ICV D254 SENSY **LEVEL2** BIODIVA **VITILEVURE** M83 MT ELIXIR

GRAPE AND YEAST PAIRINGS

Malbec

Dark Fruit	Jam	Spice	Floral	Tannin Intensity	Mid-palate Enhancement
ENOFERM RP15 SYRAH **LALVIN** CLOS ICV D254 ICV D21 RHÔNE 2226 TANGO	**LALVIN** BDX CLOS ICV D254 TANGO **UVAFERM** VRB	**ENOFERM** RP15 **LALVIN** ICV D80 **LEVEL2** BIODIVA **VITILEVURE** MT	**ENOFERM** RP15 SYRAH **LALVIN** ICV D21 PERSY RHÔNE 2226 **LEVEL2** BIODIVA	**LALVIN** CLOS ICV D80 RHÔNE 2226 **VITILEVURE** MT	**IONYS$_{WF}$** **LALVIN** BM 45 ICV D21 ICV D254 **LEVEL2** BIODIVA

Merlot

Berry	Plum	Spice	Color Stability	Ageable Tannins
ENOFERM CSM RP15 **LALVIN** CLOS ICV D21 ICV GRE RHÔNE 2226 T73 **UVAFERM** VRB **VITILEVURE** MT	**LALVIN** BM45 BM 4X4 BRL97 ICV D80 ICV D254 PERSY **UVAFERM** BDX VRB	**ENOFERM** CSM RP15 **LALVIN** ICV D80 PERSY RHÔNE 2226 **LEVEL2** BIODIVA **VITILEVURE** MT	**ENOFERM** CSM RP15 **LALVIN** BM45 BM 4X4 BRL97 CLOS ICV D254 RHÔNE 2226 **UVAFERM** BDX VRB **VITILEVURE** MT	**ENOFERM** RP15 **LALVIN** CLOS ICV D21 ICV D80 **VITILEVURE** MT

Nebbiolo

Berry	Plum Jam	Licorice	Cherry	Tannin Intensity	Color Stability
ENOFERM SYRAH RP15 **LALVIN** BRL97 ICV GRE PERSY **UVAFERM** VRB **VITILEVURE** MT	**LALVIN** BM45 BM 4X4 ICV D21 **UVAFERM** VRB	**ENOFERM** RP15 SYRAH **LALVIN** BRL97 ICV D80	**ENOFERM** AMH **LALVIN** BRL97 PERSY RHÔNE 2226 **UVAFERM** 43	**LALVIN** BRL97 ICV D21 ICV D80 RHÔNE 2226 **UVAFERM** BDX	**ENOFERM** RP15 **LALVIN** BM45 BRL97 ICV D21 ICV D80 PERSY RHÔNE 2226 **UVAFERM** BDX VRB **VITILEVURE** MT

GRAPE AND YEAST PAIRINGS

Petite syrah

Fruit	Spice	Black Pepper	High Alcohol	Structural Enhancement
ENOFERM RP15 SYRAH **LALVIN** BM45 BM 4X4 BRL97 ICV D21 ICV GRE ICV D254 **UVAFERM** VRB	**ENOFERM** AMH RP15 **LALVIN** BM45 BM 4X4 ICV D80 ICV D254 ICV GRE RHÔNE 2226 **VITILEVURE** MT	**ENOFERM** RP15 **LALVIN** ICV D80 RHÔNE 2226	**ENOFERM** RP15 **LALVIN** RHÔNE 2226 **UVAFERM** 43 VRB	**IONYS$_{WF}$** **ENOFERM** RP15 **LALVIN** BM45 BM 4X4 BRL97 ICV D80 ICV D254 **UVAFERM** VRB

Pinot gris

Floral	Peach/ Apricot	Melon/Pear	Tropical Fruit	Rich Mouthfeel
CROSS EVOLUTION **LALVIN** BA11 DV10 QA23 **LEVEL2** BIODIVA **VITILEVURE** 58W3 QUARTZ	**LALVIN** BA11 ICV OPALE 2.0 QA23 RHÔNE 4600	**ENOFERM** T306 **LALVIN** DV10 ICV GRE **VITILEVURE** QUARTZ	**CROSS EVOLUTION** **ENOFERM** M1 **LALVIN** 71B BA11 ICV D47 ICV OPALE 2.0 R2 RHÔNE 4600 **LEVEL2** BIODIVA **VITILEVURE** ELIXIR	**CROSS EVOLUTION** **LALVIN** BA11 BM 4X4 ICV D47 ICV GRE ICV OPALE 2.0 RHÔNE 4600 SENSY **LEVEL2** BIODIVA **VITILEVURE** 58W3

Pinot noir

Red Fruit	Jam	Spice	Color Stability
ENOFERM AMH RP15 **LALVIN** ICV D21 PERSY RC212 W15 **VITILEVURE** 3001	**LALVIN** BM45 BM 4X4 BRL97	**ENOFERM** AMH RP15 **LEVEL2** BIODIVA	**ENOFERM** AMH RP15 **LALVIN** BM45 BM 4X4 RC212 BRL97 **VITILEVURE** 3001

GRAPE AND YEAST PAIRINGS

Riesling

Floral	Citrus	Tropical Fruit	Apple	Rose, Peach
CROSS EVOLUTION **LALVIN** BA11 DV10 W15 **LEVEL2** Flavia **VITILEVURE** 58W3 QUARTZ	**LALVIN** QA23 W15	**CROSS EVOLUTION** **LALVIN** 71B ICV GRE ICV OPALE 2.0 BA11 R2 **LEVEL2** BIODIVA **VITILEVURE** ELIXIR	**LALVIN** DV10 ICV D47 **VITILEVURE** QUARTZ	**ENOFERM** T306 **LALVIN** ICV D47 R-HST **LEVEL2** Flavia

Roussanne

Mineral	Spice	Citrus Zest	Floral	Volume
LALVIN ICV D254 W15 **VITILEVURE** QUARTZ	**LALVIN** ICV D47 ICV D254 W15 **LEVEL2** BIODIVA **VITILEVURE** 58W3	**CROSS EVOLUTION** **LALVIN** ICV D21 ICV OPALE 2.0 QA23 R-HST W15 **VITILEVURE** ELIXIR	**CROSS EVOLUTION** **LALVIN** BA11 ICV D21 W15 **LEVEL2** BIODIVA **VITILEVURE** 58W3	**CROSS EVOLUTION** **LALVIN** BA11 BM 4X4 ICV D47 ICV D254 ICV GRE ICV OPALE 2.0 **LEVEL2** BIODIVA

Sangiovese

Berry	Plum	Floral	Color Stability	Tannin Intensity	Mid-palate Enhancement
ENOFERM AMH CSM SYRAH **LALVIN** CLOS ICV D21 ICV GRE PERSY RHÔNE 2226 **UVAFERM** 43 BDX VRB **VITILEVURE** MT	**ENOFERM** SYRAH **LALVIN** BM45 BM 4X4 ICV D254 PERSY T73 **UVAFERM** VRB	**ENOFERM** SYRAH **LALVIN** ICV D80 PERSY **LEVEL2** BIODIVA **VITILEVURE** MT	**LALVIN** BM45 BM 4X4 BRL97 CLOS ICV D21 **UVAFERM** 43 BDX VRB **VITILEVURE** MT	**LALVIN** CLOS ICV D21 ICV D80 ICV D254 RHÔNE 2226 **UVAFERM** 43 **VITILEVURE** MT	**ENOFERM** CSM **IONYS$_{WF}$** **LALVIN** BM45 BM 4X4 CLOS ICV D21 ICV D254 **LEVEL2** BIODIVA **UVAFERM** VRB **VITILEVURE** MT

GRAPE AND YEAST PAIRINGS

Sauvignon blanc

Citrus	Pear/Melon	Tropical Fruit/ Passionfruit	Grassy/ Asparagus	Rich Mouthfeel
CROSS EVOLUTION **LALVIN** BA11 ICV D47 ICV OPALE 2.0 MSB QA23 **VITILEVURE** ELIXIR	**LALVIN** BA11 ICV GRE	**CROSS EVOLUTION** **LALVIN** MSB R2 SAUVY **LEVEL2** Flavia **VITILEVURE** ELIXIR	**ENOFERM** M1 **LALVIN** DV10 **VITILEVURE** QUARTZ	**CROSS EVOLUTION** **LALVIN** BA11 BM 4X4 ICV D47 ICV OPALE 2.0 MSB SENSY **LEVEL2** BIODIVA

Syrah

Fruit	Spice	Violet	Structural Enhancement	Color Stability
ENOFERM RP15 SYRAH **LALVIN** BM 4X4 BRL97 CLOS ICV D21 ICV D254 ICV GRE PERSY **UVAFERM** VRB	**ENOFERM** RP15 **LALVIN** ICV D80 ICV D254 ICV GRE PERSY **LEVEL2** BIODIVA	**ENOFERM** SYRAH **LALVIN** ICV GRE PERSY **LEVEL2** BIODIVA	**ENOFERM** RP15 **IONYS$_{WF}$** **LALVIN** BM 4X4 BRL97 CLOS ICV D80 ICV D254 PERSY **UVAFERM** VRB	**ENOFERM** RP15 **LALVIN** BM 4X4 BRL97 CLOS ICV D21 ICV D254 ICV D80 **UVAFERM** VRB

Tempranillo

Berry	Plum	Floral	Tannin Intensity	Mid-palate Enhancement
ENOFERM CSM RP15 SYRAH **LALVIN** CLOS ICV D21 ICV GRE PERSY RHÔNE 2226 **UVAFERM** BDX VRB **VITILEVURE** MT	**ENOFERM** SYRAH **LALVIN** BM45 BM 4X4 ICV D254 T73 **UVAFERM** VRB	**ENOFERM** SYRAH **LALVIN** ICV D80 **LEVEL2** BIODIVA **VITILEVURE** MT	**LALVIN** CLOS ICV D21 ICV D80 ICV D254 RHÔNE 2226 **UVAFERM** 43 BDX	**ENOFERM** CSM RP15 **IONYS$_{WF}$** **LALVIN** BM45 BM 4X4 CLOS ICV D21 ICV D254 **UVAFERM** VRB **VITILEVURE** MT

GRAPE AND YEAST PAIRINGS

Viognier

Floral	Stone Fruit	Spice	Tropical Fruit	Rich Mouthfeel
CROSS EVOLUTION **LALVIN** BA11 DV10 QA23 R2 **LEVEL2** BIODIVA **VITILEVURE** 58W3 QUARTZ	**LALVIN** BA11 ICV D47 ICV D254 RHÔNE 4600	**LALVIN** ICV D47 ICV D254 W15 **LEVEL2** BIODIVA **VITILEVURE** 58W3	**CROSS EVOLUTION** **ENOFERM** T306 **LALVIN** 71B BA11 ICV GRE ICV OPALE 2.0 QA23 R2 **LEVEL2** BIODIVA **VITILEVURE** ELIXIR	**CROSS EVOLUTION** **LALVIN** BA11 BM 4X4 ICV D47 ICV GRE ICV OPALE 2.0 RHÔNE 4600 **LEVEL2** BIODIVA

Zinfandel

Berry	Jam	Mineral	Black Pepper	Spice	Plum	High Alcohol
ENOFERM AMH RP15 SYRAH **LALVIN** BM 4X4 BRL97 CLOS ICV D21 ICV D254 PERSY **UVAFERM** BDX VRB	**LALVIN** BM 4X4 RHÔNE 2226 T73 **UVAFERM** VRB	**ENOFERM** AMH RP15 **LALVIN** CLOS ICV D80	**LALVIN** ICV D80 RHÔNE 2226	**ENOFERM** AMH RP15 **LALVIN** BM 4X4 BRL97 ICV D80 PERSY RHÔNE 2226	**ENOFERM** SYRAH **LALVIN** BM 4X4 ICV D254 PERSY T73 **UVAFERM** VRB	**ENOFERM** RP15 **LALVIN** CLOS RHÔNE 2226 **UVAFERM** 43 VRB

NON-*SACCHAROMYCES* YEAST

LEVEL 2 SOLUTIONS

Lallemand is proud to produce four non-*Saccharomyces* yeast strains – two *Metschnikowia* yeast, *Torulaspora delbrueckii*, and a *Lachancea thermotolerans*. The biological control contribution of the non-conventional yeast in conjunction with the security of the *S. cerevisiae* enables winemakers to impact the sensory qualities and complexity of their wine while ensuring a reliable and complete fermentation.

BIODIVA™ *TORULASPORA DELBRUECKII**

Enhance aromatic complexity and mouthfeel

Originally released in kit form as LEVEL2 TD™ for white wines, Lallemand has relaunched this yeast as a single product – BIODIVA™. Now winemakers can select *Torulaspora delbrueckii* and pair it with the appropriate *Saccharomyces cerevisiae* strain for both red and white wines. Enhance varietal and fermentation ester characters while contributing to mouthfeel and an overall increase in aromatic complexity. Suggested varieties include Chardonnay, Sémillon, Syrah and Pinot noir.
*Contact a Lallemand representative to discuss a suitably paired *Saccharomyces cerevisiae* yeast.

FLAVIA™ *METSCHNIKOWIA PULCHERRIMA**

Overexpress aromatic terpenes and volatile thiols

FLAVIA™ is a pure culture of *Metschnikowia pulcherrima* selected from nature by the Universidad de Santiago de Chile (USACH) for its specific capacity to release enzymes with – arabinofuranosidase activity. When used in sequential inoculation with a compatible selected *Saccharomyces cerevisiae* yeast strain, FLAVIA™ will impact the production of such varietal aromas as terpenes and volatile thiols. Under certain conditions, *M. pulcherrima* does not show fermentative activity. However, the enzymatic activity of *M. pulcherrima* gives the desired outcomes. Best results are achieved when FLAVIA™ is sequentially inoculated with a *S. cerevisiae* strain that is a high terpene/thiol releaser/converter. Suggested varieties include Riesling, Sauvignon Blanc and Colombard.
*Contact a Lallemand representative to discuss a suitably paired *Saccharomyces cerevisiae*.

GAÏA™ *METSCHNIKOWIA FRUCTICOLA*

Manage cold soaks with reduced spoilage risk -

Vincent Gerbeaux of the IFV (Institute du Francais de Vigne et du Vin) in Beaune, has selected a Gaïa yeast for use during cold soak. The presence of Gaïa™ MF98.3 during cold soak limits *Kloeckera apiculata* growth and acetic acid production. This opens new ways to manage pre-fermentative cold soak with a biological alternative to SO_2.

LAKTIA™ *LACHANCEA THERMOTOLERANS*

For varietals lacking in acidity

NEW LAKTIA™ is a pure culture of Lachancea thermotolerans isolated from the Rioja region of Spain that produces lactic acid from sugar when added at the beginning of the alcoholic fermentation. This will bring a freshness and aromatic complexity to wines, and not a lactic/dairy quality. Using LAKTIA™ can give winemakers an interesting blending opportunity for wines lacking in acidity. LAKTIA™ must be followed up with a *Saccharomyces cerevisiae* to complete the alcoholic fermentation.

YEAST PROTECTANTS AND STIMULANTS FOR ALCOHOLIC FERMENTATION

Since Lallemand began producing yeast in the early 20th century, we have understood the importance of providing growing yeast the nutrients they need to survive and reach their maximum potential. Experiences in our own yeast production fermentations laid the groundwork for our nutrient formulations. We have also collaborated with others in the area of yeast growth nutrition and fermentation to attempt to understand the complex and often frustrating interactions in grape must.

Lallemand offers three categories of yeast fermentation aids:

1. Protectants added to yeast rehydration water
2. Stimulants for use during fermentation
3. Nutrients for use during fermentation.

Protectants added to the yeast rehydration water

GO-FERM PROTECT EVOLUTION™

OMRI listed

GO-FERM PROTECT EVOLUTION™ optimizes the micronutrient bioavailability of GO-FERM with the added benefit of survival factor protection through the NATSTEP™ process. These survival factors include specific sterols and polyunsaturated fatty acids that strengthen the yeast membrane during rehydration, making it more resistant to fermentation stress. GO-FERM PROTECT EVOLUTION™ is used in the yeast rehydration water to create a suspension of micronutrients and survival factors that are bioavailable for selected yeasts. GO-FERM PROTECT EVOLUTION™ is recommended in place of GO-FERM™ for very difficult fermentation conditions, such as:

1. High maturity conditions (>25° Brix) to protect yeast against osmotic shock, helping avoid high volatile acidity production during fermentation
2. High potential alcohol conditions to protect yeast against alcohol toxicity, helping avoid sluggish fermentation finishes
3. Over clarified juices to help supply key yeast survival factors
4. Restarting stuck fermentations to protect and condition the “rescue yeast” against high alcohol conditions
5. When oxygen additions are not possible during fermentation.

Dosage recommendations: Use 30 g/hL (2.4 lb/1000 gal) of GO-FERM PROTECT EVOLUTION™ to stimulate and protect the rehydrating yeast.
Note: This recommendation is based on a yeast inoculum of 25 g/hL (2 lb/1000 gal). If using more or less yeast, respect a ratio of 1 part yeast: 1.25 parts GO-FERM PROTECT EVOLUTION™.

YEAST PROTECTANTS AND STIMULANTS FOR ALCOHOLIC FERMENTATION

Stimulants for use during fermentation

STIMULA CHARDONNAY™

NEW STIMULA CHARDONNAY™ is a 100% autolysed yeast nutrient rich in vitamins and minerals that stimulate volatile ester production by the yeast. Add 40 g/hL (3.4 lb/1000 gal) of STIMULA CHARDONNAY™ at the end of the yeast growth phase which is at 1/3rd of the way through alcohol fermentation.

STIMULA SAUVIGNON BLANC™

NEW STIMULA SAUVIGNON BLANC™ is a 100% autolysed yeast nutrient rich in vitamins and minerals that stimulate the yeast uptake of 4MMP and 3MH precursors and their bio-conversion to volatile thiols. The best timing to add 40 g/hL (3.4 lb/1000 gal) of STIMULA SAUVIGNON BLANC™ is at the start of alcohol fermentation.

YEAST NUTRIENTS FOR ALCOHOLIC FERMENTATION

Complex yeast nutrients for use during fermentation

FERMAID O™

OMRI listed

FERMAID O™ is the latest nutrient developed by our winemaking nutrient research team headed by Dr. Anne Ortiz-Julien. FERMAID O™ is a blend of inactivated yeast fractions rich in organic nitrogen. FERMAID O™ does not contain added ammonia salts (DAP) or micronutrients. The importance of organic nitrogen from yeasts is well known as a highly efficient nutrient source for wine yeasts, especially when compared to inorganic nitrogen from DAP. In addition, FERMAID O™ consistently produces lower heat of fermentation and lower levels of negative sulfur compounds, compared with DAP. With its organic nitrogen, FERMAID O™ can help winemakers achieve steady fermentations, while limiting temperature peaks. When inorganic nitrogen (DAP) additions are NOT desired, the use of GO-FERM PROTECT EVOLUTION™ and FERMAID O™ is recommended. With this combination, GO-FERM PROTECT EVOLUTION™ provides needed micronutrients during yeast rehydration, and FERMAID O (when added at 1/3 sugar depletion) supplies critical nutrients to help the yeast avoid stressed conditions. **Note:** In low nutrient situations, yeast assimilable nitrogen may be insufficient to avoid fermentation problems. Refer to page 33 for dosage recommendations.

FERMAID K™

The original and reliable FERMAID K™ is a blended complex yeast nutrient that supplies inorganic nitrogen (DAP), organic nitrogen (alpha-amino nitrogen), key nutrients (magnesium sulfate, thiamine, folic acid, niacin and calcium pantothenate) and inactivated yeast.
It is best to add FERMAID K™ over two additions. The first addition is made at the end of the lag phase (6 to 12 hours after yeast inoculation) and the second addition is made around 1/3 sugar depletion (the end of exponential growth and the beginning of the stationary phase).
With proper rehydration and handling, the yeast cell population should be at least 4 million cells/mL at inoculation. By the time the second FERMAID K™ addition is made, this population should have grown to about 100 million cells/mL. It is critical to remember that yeast are still reproducing during the stationary phase, and to do this effectively, especially in high sugar musts, they need oxygen as well as the components of FERMAID K™, including nitrogen (for protein synthesis), sterols and fatty acids (for maintaining alcohol resistance and permease activity). In addition, the inactivated yeast cell walls in FERMAID K™ adsorb medium-chain fatty acids that are toxic to yeast, and provide nucleation sites to help keep the yeast in suspension.
Refer to page 33 for dosage recommendations.

YEAST NUTRIENTS FOR ALCOHOLIC FERMENTATION

IMPORTANT!
NEVER USE NUTRIENTS CONTAINING AMMONIA SALTS, SUCH AS DAP, DURING YEAST REHYDRATION—THEY ARE TOXIC TO THE YEAST AT HIGH LEVELS!

YAN content of nutrients used in alcoholic fermentation						
Nutrient	1 g/hL	12.5 g/hL (1 lb/1000 gal)	20 g/hL (1.7 lb/1000 gal)	25 g/hL (2 lb/1000 gal)	30 g/hL (2.4 lb/1000 gal)	YAN Source
DAP	2 mg/L	25 mg/L	40 mg/L	50 mg/L	63 mg/L	Inorganic nitrogen
FERMAID K™	1 mg/L	12.5 mg/L	20 mg/L	25 mg/L	30 mg/L	Inorganic and organic nitrogen
FERMAID O™	0.4 mg/L		8 mg/L		16 mg/L*	Organic nitrogen
STIMULA™					16 mg/L*	Organic nitrogen.

* 40 g/hL

RESKUE™ TREATMENT OF STUCK FERMENTATIONS

RESKUE™ is a new specific inactivated yeast, developed by the Lallemand Research and Development group for use in treating stuck fermentations. Low yeast viability is a common problem in alcoholic fermentations, and may be caused by the presence of residual fungicides and/or short- and medium-chain saturated fatty acids, such as hexanoic, octanoic, decanoic and dodecanoic fatty acids and their esters. The production of these saturated fatty acids by yeast is favored by stressful fermentation conditions, which can arise with low juice turbidity, very high initial sugars, the condition of the selected yeast, or extreme fermentation temperatures during the later phase of fermentation. Saturated fatty acids modify the yeast sugar transport capacity by interfering with the membrane sugar transport proteins. RESKUE™ is a specific inactivated yeast that has very high bio-adsorptive properties for saturated short- and medium-chain fatty acids and fungicides. With these properties, RESKUE™ helps secure the end of alcoholic fermentation. Dosage: add 40 g/hL of RESKUE™ to the stuck wine and let settle then rack off before inoculating with a restart yeast.

NUTRIENT VIT END™ TREATMENT OF SLUGGISH FERMENTATIONS

OMRI listed

NUTRIENT VIT END™ is derived from specific inactivated yeast for treatment of sluggish fermentations. This specific inactive yeast supplements sluggish fermentations with a balance of highly bio-adsorptive and survival factors that help the alcoholic fermentation to completion. **Note:** Although NUTRIENT VIT END™ provides a minor supply of yeast nutrients, such as organic nitrogen, it does not replace the regular nutrition program integrating juice parameters and the nutritional needs of yeasts. Dosage: As soon as you suspect an alcoholic fermentation is sluggish add 30 g/hL of NUTRIENT VIT END™.

YEAST NUTRIENTS FOR ALCOHOLIC FERMENTATION

FERMENTATION MANAGEMENT

In order to conduct a healthy and a complete fermentation, yeast need more than nitrogen. In fact, the lipid, mineral and vitamin co-factors are essential. If limited and/or imbalanced, the yeast will struggle to complete the fermentation and the resulting wine may be slow, sluggish or stuck, and the production of negative sensory compounds may be obvious.
To calculate your additions, based on sugar, yeast strain requirements, and your fermentation goals, follow the outline below.

1. To tailor a fermentation plan to your needs, begin by calculating the theoretical nitrogen requirements based on two factors: sugar to be fermented and the yeast strain nitrogen requirements.

SUGAR	YEAST STRAIN NITROGEN REQUIREMENTS		
Brix	**Low**	**Medium**	**High**
20	150	180	250
22	165	200	275
24	180	220	300
26	195	240	325
28	210	260	350
30	225	280	375

2. Calculate the supplemented nitrogen required:
   a. Theoretical Nitrogen required (table 1) - Juice/Must YAN = SUPPLEMENTED YAN
3. Determine fermentation goal:
   a. Fermentation security
   b. Fermentation security and optimization of thiols
   c. Fermentation security and optimization of esters
4. Once YAN supplementation and fermentation goal has been determined, follow one of the three suggested protocols shown on the opposite page.
   The use of Go-Ferm Protect Evolution™ is an autolyzed yeast naturally providing the essential lipids and vitamins to balance the nitrogen uptake and act as fermentation security cofactors. The nitrogen required to secure the fermentation is supplied by the Fermaid™ family of complex yeast nutrients. The goal of the Stimula™ range is to naturally supply vitamins and minerals to assist with the yeasts aromatic metabolism as well as supply nitrogen. To optimize yeast performance, all components are required since solely focusing on nitrogen management is no longer appropriate for a healthy fermentation.

YEAST NUTRIENTS FOR ALCOHOLIC FERMENTATION

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 Go-Ferm Protect Evolution™	No addition	30 g/hL Fermaid O™
51 - 100 ppm	30 g/hL Go-Ferm Protect Evolution™	20 g/hL Fermaid O™	20 g/hL Fermaid O™ + 12.5 g/hL Fermaid K™
101 - 150 ppm	30 g/hL Go-Ferm Protect Evolution™	40 g/hL Fermaid O™	30 g/hL Fermaid K™ or 40 g/hL Fermaid O™

GOAL: OPTIMIZATION OF THIOLS

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 Go-Ferm Protect Evolution™	Stimula Sauvignon Blanc™ 40 g/hL	10 g/hL Fermaid O™
51 - 100 ppm	30 g/hL Go-Ferm Protect Evolution™	Stimula Sauvignon Blanc™ 40 g/hL	20 g/hL Fermaid O™
101 - 150 ppm	30 g/hL Go-Ferm Protect Evolution™	Stimula Sauvignon Blanc™ 40 g/hL	40 g/hL Fermaid O™

GOAL: OPTIMIZATION OF ESTERS

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 Go-Ferm Protect Evolution™	No addition	Stimula Chardonnay™ 40 g/hL™
51 - 100 ppm	30 g/hL Go-Ferm Protect Evolution™	20 g/hL Fermaid O™	Stimula Chardonnay™ 40 g/hL
101 - 150 ppm	30 g/hL Go-Ferm Protect Evolution™	40 g/hL Fermaid O™	Stimula Chardonnay™ 40 g/hL

YEAST NUTRIENTS FOR ALCOHOLIC FERMENTATION

Yeast Protection and Nutrition Guidelines for Reliable Fermentations

*Although the initial levels of YAN in the juice or must help guide the nutrient strategy, avoid chasing YAN numbers through excessive nitrogen additions. Instead, consider the quality of the nitrogen (inorganic vs. organic), the balance and availability of micronutrients, the relative nitrogen demand of the selected yeast, the temperature and aeration management, as well as other good fermentation practices – all of which greatly impact the overall yeast health and resulting fermentation.

The above guidelines are based on an optimized protection and nutrition strategy. However, if you can only make one FERMAID addition, add the total amount around 1/3 through AF. This same timing holds true for aeration but be careful making any additions during this very active phase of fermentation of white or rosé wines due to sudden CO_2 release.

Sluggish fermentation?
Add Nutrient VIT END™ or RESKUE™ when there is a slowdown around 2/3 through AF of less than 0.5 Baume or 1° Brix/day, except for slow fermenting yeasts or fermenting < 12°C (53°F).

Adjustments for high Brix musts (above 25° Brix) can also be successfully accomplished in two ways

1. When sugars are above 25° Brix, we recommend increasing the yeast inoculation rate from 25 g/hL (2 lb/1000 gal) to 35 g/hL (2.8 lb/1000 gal). Starting at a higher inoculation rate will help avoid a dilution effect and maintain the yeast's survival factors above critical levels. This higher cell density is helpful in order to successfully convert all of the sugar into alcohol during the course of the fermentation.
2. Select a yeast with lower relative nitrogen demands and higher alcohol tolerance (i.e., LALVIN QA23™, LALVIN T73™, LALVIN DV10™ or ENOFERM RP15™). For more information, please refer to the Yeast Chart (see pages 18 and 19) and the Yeast section (starting on page 5).

Other good fermentation practice considerations when dealing with high Brix musts

In reds:
- Aerate or add oxygen after the cap forms (usually when 30-40 g/L (2.4-3.2 lb/1000 gal) sugar is consumed or 3-4° Brix drop) and again around 1/3 sugar depletion
- Be careful to manage the temperature during yeast rehydration, the initial phase of fermentation, and at the peak of fermentation
- Regularly move the yeast during their death phase, toward the end of fermentation.

In whites:
- Aim for an optimum initial juice turbidity level between 80-150 NTU
- Aerate or add oxygen during the middle of yeast growth phase (3-4° Brix drop) and again around 1/3 sugar depletion
- Be careful to manage the temperature during yeast rehydration, yeast inoculation, and at the end of fermentation
- Regularly move the yeast during their death phase, toward the end of fermentation.

BACTERIA

Malolactic Bacteria Selected from Nature

In North America, Lallemand offers two popular formats of active bacteria cultures.

MBR™ process
direct inoculation

An easy protocol:
direct inoculation

Inoculation

The MBR™ freeze-dried form of malolactic bacteria represents a Lallemand acclimatization process that subjects the bacteria cells to various biophysical stresses, making them better able to withstand the rigors of direct addition to wine. The conditioned MBR™ bacteria that survive are robust and possess the ability to conduct reliable malolactic fermentation (MLF), even under difficult wine conditions.

malotabs™

Selected wine bacteria for malolactic fermentation are now available in a tablet form. Malotabs™ is a specific *Oenococcus oeni* tablet developed for an easy and simple inoculation in barrels and an easy induction of malolactic fermentation. Easy-to-use and easy-to-add to barrels, Malotabs™ ensure a fast bacterial dissolution and dispersion, complete and homogeneous throughout the entire volume of the barrel.

MBR™ BACTERIA *OENOCOCCUS OENI* CULTURES

ENOFERM ALPHA™

Structure and fruit, adapted to high alcohol wines

ENOFERM ALPHA™ was selected by the Institut Francais de la Vigne et du Vin (IFV) from spontaneous malolactic fermentations showing good fermentation activity and sensory contribution. ALPHA™ is a dominant strain and has the capacity to achieve reliable MLF, even showing good resistance to botrycides. The contribution of ALPHA™ to wine is usually described as enhancing the mouthfeel, while respecting the wine's varietal character. The lower perception of green and vegetative flavors is the result of the very positive impact of ALPHA™ on wine complexity.

ENOFERM BETA™

For co-inoculation

ENOFERM BETA™ was isolated in Italy and is best used to enhance tannin structure and red berry varietal character in reds. The name "Beta" comes from its capacity to increase levels of beta-damascenone and beta-ionone, which contribute floral notes, especially in Merlot. BETA™ benefits from the addition of a malolactic nutrient, such as ACTI-ML™. BETA™ is available in MBR™ and BETA CO-INOC™ form. Refer to page 48 for co-inoculation in whites and reds.

MBR™ BACTERIA *OENOCOCCUS OENI* CULTURES

LALVIN 31™

For cool climate, adapted to high lactic acid content, low pH and low temperature wines

LALVIN 31™ was selected by the Institut Francais de la Vigne et du Vin (IFV), and performs well under stressful low pH or low temperature conditions. LALVIN 31™ is noted for its good sensory balance in Pinot noir and white wines, and for low production of biogenic amines; LALVIN 31™ benefits from the addition of a malolactic nutrient such as OPTI'MALO BLANC™. .

LALVIN ELIOS 1™

For spice contribution and integration of highly ripened fruit

LALVIN ELIOS 1™ was isolated by the Institut Coopératif du Vin (ICV) in Montpellier, France, from spontaneous malolactic fermentations showing very good fermentation performance, as well as positive sensory profiles. LALVIN ELIOS 1™ consistently demonstrated good fermentation kinetics under such difficult MLF conditions as high alcohol. This malolactic bacteria culture enhances the perception of overall tannin intensity, while avoiding green and vegetative character development.

LALVIN VP41™

Supports red berry fruit and very low diacetyl production

LALVIN VP41™ was isolated in Italy during an extensive European Union collaboration to research natural *Oenococcus oeni* strains. The positive mouthfeel contribution of LALVIN VP41™ stood out in tastings when compared to other ML bacteria strains. The very good implantation, high alcohol and SO_2 tolerance, plus the steady fermentation kinetics of LALVIN VP41™, make it a very reliable malolactic fermentation culture to use when a significant impact on wine structure is desired.

O-MEGA™

For fruit-driven white wines

O-MEGA™ was isolated and selected in the south of France by the Institut Français de la Vigne et du Vin (IFV) in Burgundy for its capacity to quickly achieve malolactic fermentation (MLF) in a wide range of applications. O-MEGA™ is a secure and effective strain that tolerates low pH or high alcohol conditions, and is easy to use. O-MEGA™ complements fresh and fruit-driven white wines.

PN4™

The Rocket, supports tannin structure

The PN4™ bacteria was isolated from a spontaneous malolactic fermentation in a Pinot noir by the Fondazione Edmund Mach in Trentino, Italy. This bacteria demonstrates its capacity to achieve malolactic fermentation for red and white wines in difficult conditions of pH, alcohol and $S0_2$. The PN4™ bacteria is well suited for spicy and structured Pinot noir wines, and may also be used to carry out malolactic fermentation in Chardonnay.

LALVIN SILKA™

For oak integration and fruit balance

NEW LALVIN SILKA™ was isolated in La Rioja Spain by Instituto de Ciencias de la Vid y del Vino (ICVV), for its unique sensory properties. Aside from its resistance to high alcohol and steady MLF kinetics, LALVIN SILKA™ is recognized for its positive impact on softening astringency and bitterness. LALVIN SILKA™ is recommended for conducting MLF in contact with oak resulting in balanced wines with silky structure and aromatic freshness.

MALOLACTIC BACTERIA NUTRIENTS

ACTI-ML™

The nutrient for malolactic bacteria rehydration

ACTI-ML™ was developed by the Lallemand bacteria R&D team led by Dr. Sibylle Krieger. For MLF in difficult wines, add ACTI-ML™ to the bacteria culture's rehydration water. ACTI-ML™ is a specific blend of inactive yeasts rich in amino acids, mineral cofactors and vitamins. These inactive yeasts are mixed with cellulose to provide more surface area to help keep bacteria in suspension.
Dosage recommendation: Dissolve 20 g (0.05 lb) of ACTI-ML™ in 200 ml (6,7 oz) of 25°C (77°F) clean water then add 1 g (0.035 oz) of bacteria. Wait 15 minutes and add the suspension to 100 L (26.4 gal.) of wine.

ML RED BOOST™

The nutrient for high maturity red wines

OMRI listed

ML RED BOOST™ is a malolactic fermentation nutrient specifically formulated from inactivated yeast fractions for the application of conducting MLF in challenging red wines with high maturity (Malbec, Merlot, Syrah or Zinfandel). ML RED BOOST™was developed by Lallemand after investigating lactic acid bacteria's specific nutritional requirements, and the role of specific yeasts fractions that improved the resistance of wine bacteria against the inhibitory effects of high polyphenolic content in red wines. The bioavailability of certain peptides strongly favor the growth of Lallemand selected wine bacteria, and the quality of specific polysaccharides included in ML RED BOOST™ are particularly effective in reducing the MLF duration especially in challenging red wine environments.
Dosage recommendation: Add 20 g/hL (1.6 lb/1000 gal) calculated on final wine volume to a small amount of water or wine then add directly to the wine, 24 hours before the addition of bacteria.

OPTI'MALO BLANC™

The nutrient for white wines

OMRI listed

OPTI'MALO BLANC™ is a malolactic fermentation nutrient specifically formulated from inactivated yeast fractions for the application of conducting MLF in challenging white wines. OPTI'MALO BLANC™ was developed by Lallemand after intensive investigations into specific nutritional requirements of lactic acid bacteria. The bioavailability of certain peptides strongly favor the growth of Lallemand selected wine bacteria and are particularly effective in reducing the MLF duration especially under more difficult white winemaking conditions.
Dosage recommendation: Add 20 g/hL (1.6 lb/1000 gal) calculated on final wine volume to a small amount of water or wine then add directly to the wine.

SPECIFIC INACTIVATED YEAST

Building Smooth and Balanced Wines

Lallemand researchers have propelled us into exciting territory. One example is the development of a range of specific inactivated yeast products harvested from selected natural yeasts at the end of their growth phase, when their polysaccharides are more reactive than those released during autolysis. There are also other inactivated yeast components, such as peptides, that have winemaking applications. These specific inactivated yeast provide a minor supply of nutrients, but do not replace the regular nutrition program integrating juice parameters and the nutritional needs of yeast.

BOOSTER BLANC™

Increase smooth mid-palate intensity and fresh fruit in whites

BOOSTER BLANC™ is made from the inactivated yeast cells of a yeast isolated and selected by the ICV. It is produced with an inactivation process exclusive to Lallemand that makes the soluble fractions of the yeast cell walls rapidly available in the must. When added to the juice, BOOSTER BLANC™ participates in the colloidal balance of the wine, boosting the smooth mid-palate intensity and protecting the fresh fruit aromas of white and rosé wines. Interactions between the aroma compounds and the inactivated yeast macromolecules from BOOSTER BLANC™ smoothes the wine and limits aggressive ethereal, chemical and burning perceptions, particularly in wines made from botrytized grapes.

For high-end white or rosé wines from ripe grapes, BOOSTER BLANC™ helps develop intense and balanced aromas mid-palate, making it a good sensory complement for wines fermented with LALVIN ICV D47™ and LALVIN ICV D21™. BOOSTER BLANC™ may also be added toward the end of fermentation to add smooth mid-palate intensity and decrease perception of woody aromas, such as sap/sawdust, in wines aging in new barrels.

Dosage recommendations: Add BOOSTER BLANC™ to the juice at 20-40 g/hL (1.6-3.2 lb/1000 gal) for a smoother mid-palate and aromatic freshness. Add BOOSTER BLANC™ toward the end of fermentation at 20-30 g/hL (1.6-2.4 lb/1000 gal) for a smoother mid-palate intensity contribution and overall balance.

BOOSTER ROUGE™

For higher and smoother tannin intensity in red wines

BOOSTER ROUGE™ originates from a specific natural wine yeast isolated and selected by the ICV. The yeast macromolecules in BOOSTER ROUGE™ interact with red wine polyphenols resulting in a positive influence on the colloidal balance of the wine. Especially when used in red musts sourced from hot climates, BOOSTER ROUGE™ wines are perceived as having higher fore-mouth volume and smoother mid-palate tannic intensity, as well as fresher aromatic sensations.

BOOSTER ROUGE™ complements short maceration premium reds fermented with LALVIN ICV GRE™ for smooth mid-palate intensity and fresh varietal aromas, while avoiding sensations of aggressive and drying tannins. In ultra-premium reds from balanced ripe mature grapes, BOOSTER ROUGE™ shows good synergy with LALVIN ICV D80™ and LALVIN ICV D21™ for enhancing licorice aromas and smooth mid-palate intensity. BOOSTER ROUGE™ may also be added towards the end of fermentation to contribute fore-mouth volume, smoother mid-palate tannin intensity and help with alcohol integration.

Dosage recommendation: Add BOOSTER ROUGE™ to the must at 227 g/ton (0.5 lb/ton) or 30 g/hL (2.4 lb/1000 gal) toward the end of fermentation.

SPECIFIC INACTIVATED YEAST

NOBLESSE™

For smooth and balanced wines

OMRI listed

The inactivated yeast cells of a popular ICV selected yeast are now available for sulfur compound prevention during fermentation and aging. NOBLESSE™ smoothes and stabilizes the wine's colloidal balance, resulting in:

- Increased perception of ripe fruit
- More intense structure, initial volume and smooth finish
- Decreased perception of "sawdust/sap" in wines aged in new barrels
- Decreased perception of harsh, chemical and burning sensations
- Stimulation of malolactic fermentation.

Dosage recommendation: Add 20-30 g/hL (1.6-2.4 lb/1000 gal) of NOBLESSE™ to the must, or toward the end of fermentation.

OPTI-RED™

For rounded and smooth tannin red wines

OMRI listed

OPTI-RED™ is a unique natural yeast preparation that undergoes a specific refining process resulting in a high level of polyphenol-reactive yeast cell wall polysaccharides. OPTI-RED™ is used at the beginning of red wine fermentations to obtain fuller bodied, more color stable, smooth palate wines.

Using OPTI-RED™ in the must provides early polysaccharide availability for the complexing with polyphenols as soon as they are released and diffused. This early complexing results in smoother red wines with more stable color, rounder mouthfeel and better harsh or green tannin integration. OPTI-RED™ can be used alone or in conjunction with enological macerating enzymes such as LALLZYME EX™. Using OPTI-RED™ toward the end of fermentation allows the winemaker to shape harsh polyphenols into smoother more approachable tannins.

Dosage recommendation: Add OPTI-RED™ to the must at 227 g/ton (0.5 lb/ton) or 30 g/hL (2.4 lb/1000 gal) toward the end of fermentation.

OPTI-MUM RED™

For increased roundness in red wines

OMRI listed

OPTI-MUM RED™ is a unique natural specific inactivated yeast rich in polysaccharides. OPTI-MUM RED™ benefits from an optimized production process that enhances the polysaccharide availability. Adding OPTI-MUM RED™ to wine must at the beginning of fermentation increases the availability of polysaccharides when polyphenols are being released and diffused, maximizing the formation of complex polyphenol-polysaccharide chains. Add OPTI-MUM RED™ at 20 to 40 g/hL (1.6 to 3.2 lb/1000 gal) for round and structured red wines.

SPECIFIC INACTIVATED YEAST

GLUTASTAR™

For aromatic intensity and longevity in white and rosé wines

NEW GLUTASTAR™ is a new specific inactive yeast rich in reduced glutathione (antioxidant properties) and polysaccharides. GLUTASTAR™ benefits from a new optimized production process that enhances the reduced glutathione bioavailability. It has to be added at the earliest stage of grape processing in order to prevent the must from oxidation. This new biotechnological tool favors aroma intensity and longevity.
Dosage recommendation: 227 g/ton (0.5 lb/ton) or 20-40 g/hL (1.6-3.2 lb/1000 gal) added to the grapes during processing.

OPTI-WHITE™

For rounded and smooth white wines

OMRI listed OPTI-WHITE™ is a specific inactivated yeast with high antioxidant properties. Its application in white wines is patent pending. Using OPTI-WHITE™ on the juice at the beginning of fermentation results in smoothness and greater aromatic complexity in white wines. As its unique properties protect against oxidation of phenols and aromas, OPTI-WHITE™ contributes to better color preservation and the aromatic freshness of white wines. Yeast cell wall components from OPTI-WHITE™ will be solubilized during fermentation and aging. These polysaccharides will have a very positive impact, bringing more roundness and smoothness to the wine. Their action will enhance the benefits of autolysis following alcoholic fermentation.
Dosage recommendations: Add OPTI-WHITE™ to the juice at 30-50 g/hL (2.4-4 lb/1000 gal) for smoothness, antioxidative color protection and aromatic freshness. Add OPTI-WHITE™ towards the end of fermentation at 20-30 g/hL (1.6-2.4 lb/1000 gal) for smoothness and better integration of wood and alcohol.

PURE LEES LONGEVITY+ ™

The oxygen scavenger

PURE-LEES Longevity+™ is specific inactivated yeast developed in collaboration with INRA Montpellier in order to provide a tool to help wine resist oxidation during transport, storage and aging.
PURE-LEES Longevity+™ relies on the synergy of a high dissolved oxygen consumption capacity and glutathione release.

REDULESS™

Sulfur defect management

OMRI listed REDULESS™ is a unique yeast-derived product formulated to reduce sulfur off-aromas and improve the overall wine quality. Sulfur off-aromas are common defects that are sometimes very difficult to remove or mask in wine, and can be the result of biological and non-biological factors that diminish the fruit and contribute to aggressive flavor sensations.
REDULESS™ has been developed for red and white wine treatment to:
• Reduce H_2S, DMS, DES and other sulfur-related defects in wine
• Increase overall quality of the wines (more balance, fewer phenol-related off-flavors).
Dosage recommendation: Add 1 to 30 g/hL (0.084-2.4 lb/1000 gal), depending on the severity of the sulfur-like compounds in the wine.

ENZYMES

Lallemand offers winemakers a complete range of high-quality enzymes to meet winemaking needs and international quality requirements. Lallemand's expertise in winemaking applications focuses on a tailor-made approach that involves:

- Investigating winemakers' needs throughout our worldwide network
- In-depth analysis in our enzymology laboratory of all available raw material enzymes
- Elaborate testing of experimental products at technical institutes and wineries throughout the world
- Developing new products for specific winemaking applications.

LALLZYME™ microbial-origin enzymes are utilized in winemaking for:

- Clarifying musts and wines
- Macerating grapes
- Increasing the filterability of musts and wines
- Releasing flavor components
- Macerating yeast.

LALLZYME C-MAX™

Clarifying enzyme for extreme conditions

LALLZYME C-MAX™ is a cinnamyl esterase-free pectinase blend designed for fast and complete depectinization of juices in extreme conditions, such as high pectin content, low temperature or low pH.

LALLZYME CUVÉE BLANC™

White grape skin-contact macerating enzyme

LALLZYME CUVÉE BLANC™ was developed by Lallemand for use on white grapes during skin-contact maceration in order to obtain high quality white wines, rich in taste with intense mouthfeel, good structure and enhanced aromatic complexity.

LALLZYME CUVÉE BLANC™ is a very specific blend of pectinases concentrated in complementary glycosidase activities. It is low in macerating activities (cellulases, hemicellulases), and therefore provides gentle juice extraction and fast clarification after pressing. LALLZYME CUVÉE BLANC™ has been used with success in different wine regions around the world, particularly for Sauvignon blanc, Chardonnay and Semillon.

LALLZYME CUVÉE ROUGE™

Red grape cold soak macerating enzyme

CUVÉE ROUGE™ is a new enzymatic preparation presenting an optimal balance of pectinases and other side activities for prefermentative maceration in red-winemaking. It enhances the extraction of aromatic precursors and polysaccharides from the grape-berry skins. It has to be added at the very beginning of maceration (cold soak) for optimal extraction of varietal aromatic compounds. This is a new tool for the elaboration of red fruit-oriented premium wines.

ENZYMES

LALLZYME EX™

Macerating enzyme for early-release red wines

LALLZYME EX™ is specially formulated to improve color stability and enhance mouthfeel in red wines. In addition to well-balanced pectinases, LALLZYME EX™ contains key activities involved in the controlled release of polyphenols, such as galactanase (a member of the hemicellulase family) and endo-cellulase. Both of these activities aid the pectinase action on the grape cell wall and allow a progressive liberation of polyphenols and tannin-bound polysaccharides. LALLZYME EX™ has been formulated to provide a gentle maceration, making it useful on all grape varieties, even when full phenolic maturity has not been reached.

LALLZYME EX-V™

Macerating enzyme for red wines destined for aging

Due to its specific action on both grape cell walls and cell membranes, LALLZYME EX-V™ increases the extraction of intracellular polyphenolic content from red grapes, resulting in wines destined for long aging. LALLZYME EX-V™ allows for a complete and rapid release of anthocyanins and a more efficient release of tannins leading to stable anthocyanin-tannin bonding. The end result of this bonding is a more structured wine with deep, stable color. Aromatic profile analysis indicates LALLZYME EX-V™ has a great impact on the release of aromatic compounds, while respecting the varietal characteristics of the grape.

LALLZYME MMX™

Enzyme for clarification of *Botrytis* infected reds and whites, and for white wine lees maceration

LALLZYME MMX™ is a beta-glucanase and pectinase blend sourced from *Trichoderma* sp. and *Aspergillus niger*. This enzymatic preparation was developed to improve yeast autolysis of wines on lees. The result is an increase in volume and mouthfeel contributing to a fuller more rounded wine. Because of the synergy of its glucanase and pectinase activities, LALLZYME MMX™ can also be used to improve filterability of wines infected with *Botrytis*. **Note:** The use of LALLZYME MMX™ is 24.250 TTB approved as it contains enzymes sourced from *Trichoderma* sp.

ENZYMES

	Origin	Specificity	Reds or Whites	Application	Dosage*
C-MAX™	*Aspergillus niger*	High-concentration pectinase High level of pectinlyase and endo-polygalacturonase, FCE	Whites, Rose	Juice clarification in difficult conditions (low temperatures, low pH, etc.)	0.5-2 g/hL or 20-75 g/1000 gal
CUVÉE BLANC™	*Aspergillus niger*	Mid-concentration pectinase rich in secondary activities and beta-glucosidase. Low CE	Whites	Neutral or aromatic white grape skin contact maceration	20 g/ton
CUVÉE ROUGE™	*Aspergillus niger*	Mid-concentration pectinase rich in secondary activities and beta-glucosidase. Low CE	Reds	Cold soak	20-30 g/ton
EX™	*Aspergillus niger*	Mid-concentration pectinase Low CE	Reds, whites	Grape maceration, for light/fruity red wines	20-30 g/ton
EX-V™	*Aspergillus niger*	High-concentration pectinase High level of side activities (cellulase, hemicellulase), FCE	Reds	Red grape maceration for full-bodied and complex red wines	10-30 g/ton
MMX™	*Aspergillus niger/ Trichoderma* sp.	Mid-concentration pectinase and beta-glucanase FCE	*Botrytis:* reds, whites Aging: whites	Juice/wine clarification in case of *Botrytis* infection, as well as short maturation on wine lees	1-5 g/hL or 40-190 g/1000 gal

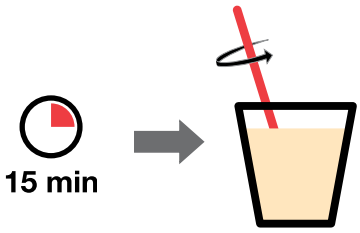
* Dosage rate depends on several factors, including the specific application, grape condition, harvest and/or winemaking parameters. For more information, contact Lallemand or your distributor.

SACCHAROMYCES YEAST REHYDRATION

Four Easy Steps for Rehydrating Yeast and Inoculating Must

1. Suspend 30 g/hL (2.4 lb/1000 gal) of GO-FERM PROTECT EVOLUTION™ in 20 times its weight of clean 43°C (110°F) water.
   IMPORTANT: If not using GO-FERM PROTECT EVOLUTION™, water temperature should be 35º-40°C (95º-104ºF) to avoid damaging the yeast.

2. Once the temperature of the GO-FERM PROTECT EVOLUTION™ solution has dropped to 40°C (104°F), add 25 g/hL (2 lb/1000 gal) of active dried yeast. Stir gently to break up any clumps. Let suspension stand for 15 to 30 minutes, then stir gently again.



Note: Foam is not an indicator of yeast viability.

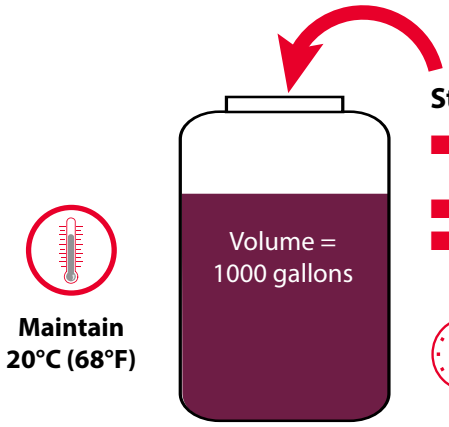
3. Slowly (5 minutes) combine an equal amount of must to be fermented with the yeast suspension. This will help the yeast adjust to cool temperature must and avoid cold shock caused by a rapid temperature drop exceeding 10°C (18°F). This atemperation may need repeating in a very low temperature must.

4. Add the yeast slurry to the bottom of the fermentation vessel just as you begin filling the vessel with must.

GO FERM PROTECT evolution

RESTARTING STUCK ALCOHOLIC FERMENTATION

Restart a stuck alcoholic fermentation using RESKUE™ and UVAFERM 43 RESTART™: volume of stuck fermentation = 1000 gallons



Stuck juice/wine preparation:

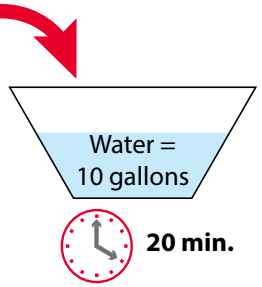
- Add 10 – 20 ppm SO_2 to help with potential spoilage organism control
- Make a **RESKUE™** addition of **1.5 kg** (3.3 lb)
- Mix and allow to settle 48 hours then rack off settled lees.

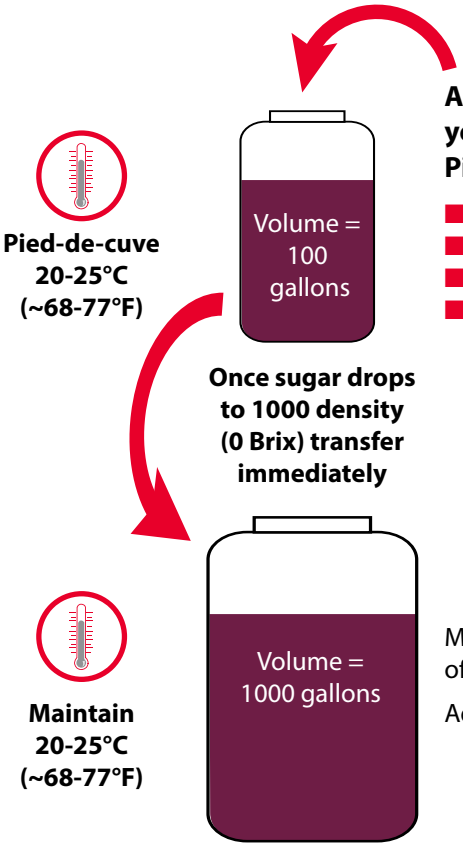
Increase Temperature (T°) of the treated juice/wine to 20-25°C (68-77°F) after racking.

Water: **43°C** (109°F) with **GOFERM PROTECT evolution™** then after a drop to **37-40°C** (99-104°F) add **UVAFERM 43 RESTART™**

- Use **2 kg** (4.4 lb) **GOFERM PROTECT evolution™**
- Use **1.5 kg** (3.3 lb) **UVAFERM 43 RESTART™**

Gently stir to break up any initial clumps then repeat gentle stir after 20 minutes.





Add the rehydrated yeast to make a Pied-de-cuve:

- **40 gallons** water
- **40 lb** sugar (adjust to 5 Brix)
- **50 gallons** post **RESKUE™** treated juice/wine
- **FERMAID O™**: 0.3 kg (2/3 lb)

Mix the Pied-de-cuve **100 gallons** into **900 gallons** of the post **RESKUE™** treated juice/wine

Add **1.5 kg** (3.3 lb) of **FERMAID O™**

SELECTING THE APPROPRIATE BACTERIA CULTURE

Guidelines for Selecting the Appropriate Lallemand MBR™ Culture

There are two basic considerations when selecting an MBR™ culture: security or the culture's compatibility to the wine environment and the culture's sensory attributes.
Note: The four main Environmental Limits have a cumulative effect on the MBR™ cultures and are the limits the MBR™ cultures can normally tolerate.

Table 1. Environmental limits and sensory impact

MBR™ BACTERIA	ENVIRONMENTAL LIMITS							
	Alcohol (% v/v)	**pH**	**Total SO_2 (mg/L)**	**Temperature (°C)**	**Impact on mouth-feel**	**Impact on fruiti-ness**	**Typical MLF kinetics Temp. dependent**	**Nutrient demand**
ENOFERM ALPHA™	< 15.5	> 3.2	< 50	> 14	****	***	Quick start, slow finish	Low
ENOFERM BETA™	< 15.0	> 3.2	< 60	> 14	**	***	Slow start, fast finish	High
LALVIN 31™	< 14.0	> 3.1	< 45	> 13	*	***	Slow start, fast finish	High
LALVIN ELIOS 1™	< 15.5	> 3.4	< 50	> 15	***	**	Reliable in reds	Low
LALVIN SILKA™	< 16.0	> 3.3	< 60	> 15	****	***	Moderate	Medium
O-MEGA™	< 16.0	> 3.1	< 60	> 14	**	****	Quick start and finish	Low
LALVIN VP41™	< 16.0	> 3.1	< 60	> 16	***	****	Moderate start and finish	Low
PN4™	< 15.5	> 3.1	< 60	> 16	**	**	Moderate start and fast finish	Medium

Direct inoculation protocol for MBR™ bacteria cultures

MBR™ process
direct inoculation

An easy protocol:
direct inoculation

SELECTING THE APPROPRIATE BACTERIA CULTURE

MLF Scorecard

To take some of the guesswork out of winemaking, Lallemand has developed this scoring system to assess the malolactic fermentation potential of a wine. Each relevant condition is assigned a score, and the total score indicates whether MLF is likely to be easy or difficult.

Table 2. Scorecard for determining the ease of malolactic fermentation

CONDITION	1 point each	2 points each	8 points each	10 points each		Score
Alcohol (% vol)	< 13	13 - 15	15 - 17	> 17	➡	
pH	> 3.4	3.1 - 3.4	2.9 - 3.1	< 2.9	➡	
Free SO_2 (mg/L)	< 8	8 - 12	12 - 15	> 15	➡	
Total SO_2 (mg/L)	< 30	30 - 40	40 - 60	> 60	➡	
Temperature (°C)	18 - 22	14 - 18 or 22 - 24	10 - 14 or 24 - 29	< 10 or > 29	➡	
Yeast's nutritional needs	Low	Medium	High	Very high	➡	
Ease of alcoholic fermentation	No problems	Transient yeast stress	Sluggish/ stuck AF	Prolonged yeast contact	➡	
Initial level of malic acid (g/L)	2 - 4	4 - 5 or 1 - 2	5 - 7 or 0.5 - 1	> 7 or < 0.5	➡	
Maximum AF rate (maximum loss of brix/day)	< 2	2 - 4	4 - 6	> 6	➡	
Note: Other, currently less well-known factors that are not considered in this scorecard may include the level of dissolved oxygen, polyphenolic content, lees compacting, pesticide residues, etc.						
Total score for the ease of malolactic fermentation:					➡	

RESULTS

Favorable: < 13 points – Pay attention to development of indigenous flora (*Brettanomyces*, contaminating bacteria, etc.) Inoculate rapidly with selected bacteria.

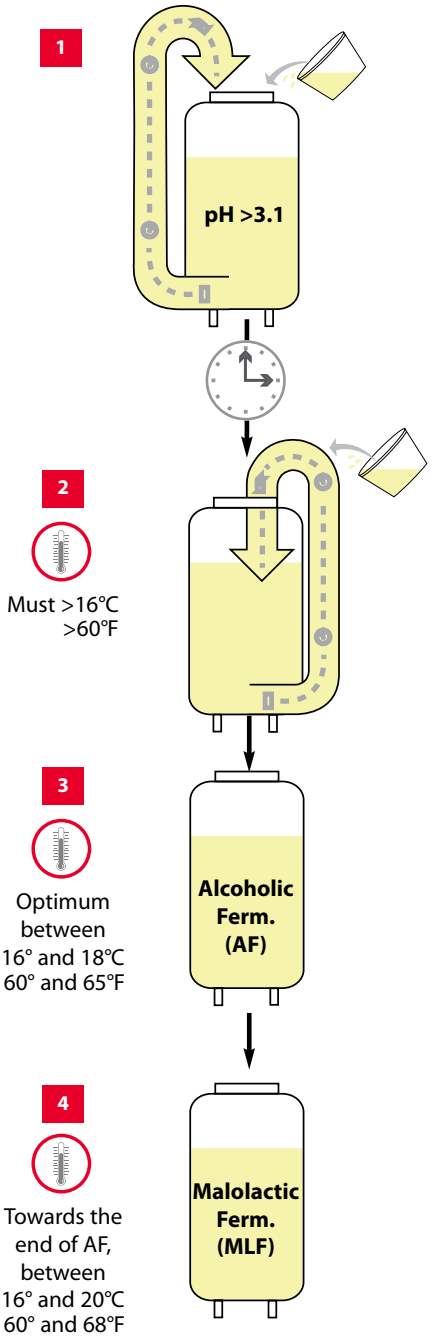
Not so favorable: 13-22 points – Choose the bacteria adapted to your wine. A specific bacteria nutrient may be necessary.

Difficult: 23-40 points – Double the dosage of bacteria adapted to your wine. Adjust conditions to optimize MLF: temperature, bacterial nutrition, etc.

Extreme: > 40 points – Run quick test or consult your Lallemand representative. Decrease the obstacles before inoculating: blending, deacidification, temperature, bacterial nutrition, etc.

CO-INOCULATION OF YEAST AND BACTERIA USING BETA CO-INOC

Co-inoculation for White Wines



- Selected, properly rehydrated and protected wine yeast.
- Choose a selected wine yeast with low nitrogen requirements adapted to the style of wine desired.
- Bacteria addition timing depends on SO_2 added:

< 50 ppm of SO_2 added: wait 24 hours
50 to 80 ppm of SO_2 added: wait 48 hours
> 80 ppm of SO_2 added: wait 72 hours
Note: If measuring free SO_2 24 hours after addition, at pH > 3.3, the free
SO_2 should be < 25 ppm and < 10 ppm when pH is below 3.3 pH.

- Open BETA CO-INOC™ malolactic bacteria sachet and add directly
to juice/must at a dosage of 0.5 g/hL (~25 gallons)
- For better dispersion, quickly rehydrate the sachet contents into clean, chlorine-free drinking water at 20°C (68°F).
- Avoiding excessive air, stir bacteria into must until evenly mixed, based on the SO_2/bacteria addition timing above.
- Complex yeast nutrition one third of the way through alcoholic fermentation.
- Monitor temperature, malic acid and volatile acidity.
- Top off tank after AF.
- When malolactic fermentation finishes during AF, monitor volatile acidity. If there is a 0.1 g/L increase per day, add 20 ppm SO_2 or
use lysozyme.
- When MLF finishes after AF, rack and stabilize the wine after MLF.

Co-inoculation for Red Wines

Same procedure as above except different temperatures in Steps 3 and 4. Step 3 normal red must starting temperature at the beginning of AF is 16° to 25°C (60° to 77°F), and once the alcohol level reaches 12.5% keep it below 25°C. Step 4 optimum temperature to finish MLF post-AF is 18° to 22°C (65° to 72°F).

Co-inoculation for Red Wines

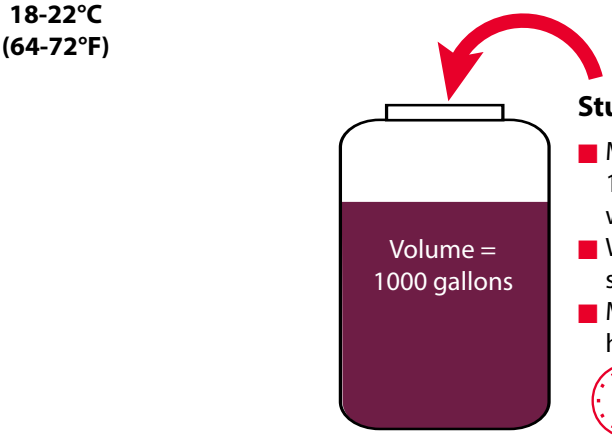
Same procedure as above except different temperatures in Steps 3 and 4. Step 3 normal red must starting temperature at the beginning of AF is 16° to 25°C (60-77°F), and once the alcohol level reaches 12.5% keep it below 25°C (77°F). Step 4 optimum temperature to finish MLF post-AF is 18° to 22°C (64-72°F).

RESTARTING STUCK MALOLACTIC FERMENTATION

Restart a stuck malolactic fermentation (MLF) using RESKUE™, ML RED BOOST™ and LALVIN VP41™ MBR: volume of stuck fermentation = 1000 gallons

Maintain a constant wine temperature between 18-22˚C (64-72°F) throughout the restart protocol until the completion of MLF

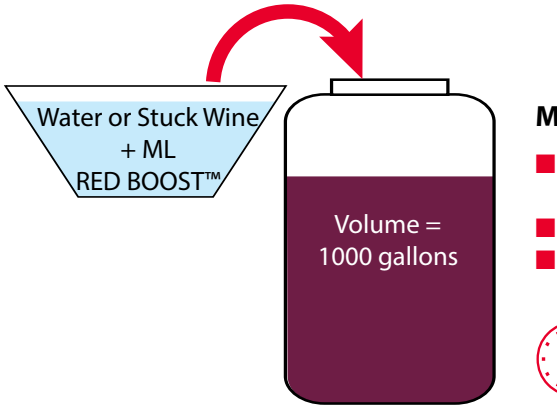
Maintain 18-22°C (64-72°F)



Stuck MLF wine preparation

- Make a RESKUE™ suspension of 1.125 kg (2.5 lb) in 10x its weight of warm (30-37°C or 86-98°F), clean water
- Wait 20 minutes then add to the 1000 gallons of stuck wine
- Mix gently without aeration and allow to settle 48 hours then carefully rack off settled lees.

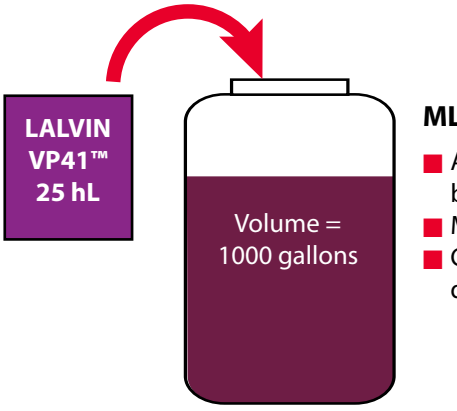
48 hours



MLF activator addition

- Make a ML RED BOOST™ addition of 0.75 kg (1.7 lb) in 7.5 L (2 gal) of warm clean water or stuck wine
- Add to the 1000 gallons of stuck wine
- Mix gently without aeration and wait 24 hours before bacteria addition.

24 hours



MLF bacteria addition

- Add 3 x 25 hL packets of LALVIN VP41™ MBR bacteria to the 1000 gallons of stuck wine
- Mix gently without aeration
- Check for MLF activity by analyzing for L-malic degradation every 2-4 days

Note:

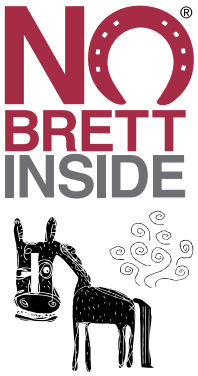
This protocol was established after several years of Lallemand R&D trials on stuck MLF wines.

Lallemand has also developed a "quick fermentability test" (48-72 hours test). This quick test can be run to determine precisely whether a wine may complete fermentation once re-inoculated. Please, contact your Lallemand representative for further information.

No Brett Inside™

FUNGAL SOURCED BIOPOLYMERS FOR BIOLOGICAL CONTROL OF WINE SPOILAGE ORGANISMS

Brettanomyces spp. control agent



Don't Bet on the Wrong Horse!

No Brett Inside™ helps to protect wines from spoilage caused by *Brettanomyces* spp., thereby reducing the production of volatile phenols.

No Brett Inside™ is a 100% natural and non-allergenic chitosan from a non-GMO strain of *Aspergillus niger*. Only chitosan sourced from *Aspergillus niger* has been administratively approved under TTB 24.250 for continuous use in wine.

No Brett Inside™ specifically targets *Brettanomyces* cells. The active ingredient, chitosan, works in two ways. The *Brettanomyces* cells are adsorbed onto the chitosan and settle out of the wine. In addition to the physical effect there is a biological effect which results in cell death. This double action of No Brett Inside™ will help control contaminating populations of *Brettanomyces* and preserve wine quality.

No Brett Inside™ recommended dosage is 4-8 g/hL (0.33-0.67 lb/1000 gal or 9-18 g/60 gallon barrel).

No Brett Inside™ is easy to use and should be added post-ML:

- Suspend No Brett Inside™ in 5 times its weight in cool water or wine (No Brett Inside™ is insoluble, so it will not go into solution).
- No Brett Inside™ can be added during a pumpover or tank/barrel mixings insuring a homogenous addition.
- Leave the No Brett Inside™ in contact with the wine for 10 days and then conduct a clean racking.
- To determine the effectiveness of your addition, a period of 20-30 days post-racking should be respected before microbial analysis. This is regardless of the method used; traditional plating, microscopic observations or RT-PCR.

Bactiless™

Acetic and lactic acid bacteria control

Bactiless™ helps protect wine from acetic and lactic acid spoilage bacteria, reducing the production of acetic acid and biogenic amines. Bactiless™ is shown to be effective against a wide spectrum of bacteria, but does not affect yeast population.

Bactiless™ contains natural and non-allergenic chitin-glucan from a non-GMO strain of *Aspergillus niger*. Only chitin-glucan sourced from *Aspergillus niger* has been administratively approved under TTB 24.250 for continuous use in wine.

Bactiless™ helps lower the viable acetic and lactic bacteria population in wine. The effectiveness of Bactiless™ can be enhanced with SO_2, but Bactiless™ does not replace the use of SO_2, since it doesn't have an antioxidant and antifungal effect. However, incorporating Bactiless™ into your program can help to reduce the amount of SO_2 additions needed to control lactic and acetic bacteria populations.

Bactiless™ recommended dosage is 20-50 g/hL (0.70-1.76 lb/1000 gal or 45-113 g/60 gallon barrel).

Bactiless™ is easy to use:

- Suspend Bactiless™ in 5 times its weight in cool water or wine (Bactiless™ is insoluble, so it will not go into solution).
- Bactiless™ can be added during a pumpover or tank/barrel mixings, insuring a homogenous addition.
- Leave Bactiless™ in contact with the wine for 10 days, and then conduct a clean racking.
- To determine the effectiveness of your addition, a period of 20-30 days post-racking should be respected before microbial analysis. This is regardless of the method used; traditional plating, microscopic observations or RT-PCR.

Bactiless

Reduce the risk of spoilage bacteria

LALLEMAND

LALLEMAND OENOLOGY

Original by culture

CALCULATIONS AND CONVERSIONS

TEMPERATURE CONVERSIONS										
C° = Degree Celsius										
F° = Degree Fahrenheit										
F° to C° = (F° - 32) x (5/9)										
C° to F° = (C° x 9/5) + 32										
C°	-18	-15	-10	10	16	21	27	32	38	49
F°	0	5	14	50	60	70	80	90	100	120

MASS CONVERSIONS		
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 tonne	=	1000 kg
1 metric tonne	=	2205 lb
1 US ton	=	2000 lb
1 US ton	=	907 kg

VOLUME CONVERSIONS		
1 mL	=	0.035 US fl oz
1 US fl oz	=	30 mL
1 L	=	1000 mL
1 L	=	0.2642 US gal
1 US gal	=	3785 mL
1 US gal	=	3.785 L
1 hL	=	100 L
1 hL	=	26.4 US gal

WEIGHT/VOLUME EQUIVALENTS
1 lb/1000 gal = 454 g/1000 gal = 0.45 g/gal = 0.12 g/L = 120 ppm = 12 g/hL
2 lb/1000 gal = 0.90 g/gal = 0.24 g/L = 240 ppm = 24 g/hL
1 g/hL = 1 g/26.42 gal = 0.038 g/gal = 0.084 lb/1000 gal

OTHER CONVERSIONS
1 kg/hL = 1000 g/hL = 10,000 mg/L = 10 g/L = 10 mg/mL
1 lb/1000 US gal = 454 g/1000 US gal = 0.454 kg/1000 US gal = 120 mg/L = 0.120 g/L
1 ppm = 1 mg/L
1 ppb = 1 mg/1000 L
1°Brix = 1% sugar (wt/vol)
1 Vol. % = 1 ml/100 mL
1 Gew. % = 1 g/100 g

CALCULATIONS AND CONVERSIONS

MOLECULAR SO_2 AT DIFFERENT ETHANOL LEVELS								
Free SO_2 (mg/L)	Molecular SO_2 (mg/L) – 18° – ethanol at 8% v/v				Molecular SO_2 (mg/L) – 18° – ethanol at 13% v/v			
	pH 3.0	pH 3.2	pH 3.4	pH 3.6	pH 3.0	pH 3.2	pH 3.4	pH 3.6
5	0.23	0,14	0.09	0.06	0.41	0.26	0.16	0.10
8	0.37	0.23	0.15	0.09	0.66	0.42	0.26	0.17
10	0.46	0.29	0.18	0.11	0.83	0.52	0.33	0.21
15	0.69	0.43	0.27	0.17	1.24	0.78	0.49	0.31

The following table is meant as an aid to help the user to calculate density data in any of the three worldwide units: Balling/Brix, Baumé and Oechsle.

COMPARISON OF DIFFERENT DENSITY DATA							
Gew. Verh. 20°/20°	Degree Balling /Brix	Degree Baumé	Degree Oechsle	Gew. Verh. 20°/20°	Degree Balling /Brix	Degree Baumé	Degree Oechsle
1.00000	0.0	0	0	1.08733	21.0	11.7	87
1.00078	0.2	0.1	1	1.08823	21.2	11.8	88
1.00155	0.4	0.2	2	1.08913	21.4	11.9	89
1.00233	0.6	0.3	2	1.09003	21.6	12.0	90
1.00311	0.8	0.45	3	1.09093	21.8	12.1	91
1.00389	1.0	0.55	4	1.09183	22.0	12.2	92
1.00779	2.0	1.1	8	1.09273	22.2	12.3	93
1.01172	3.0	1.7	12	1.09364	22.4	12.45	94
1.01567	4.0	2.2	16	1.09454	22.6	12.55	95
1.01965	5.0	2.8	20	1.09545	22.8	12.7	95
1.02366	6.0	3.3	24	1.09636	23.0	12.8	96
1.02770	7.0	3.9	28	1.09727	23.2	12.9	97
1.03176	8.0	4.4	32	1.09818	23.4	13.0	98
1.03586	9.0	5.0	36	1.09909	23.6	13.1	99
1.03998	10.0	5.6	40	1.10000	23.8	13.2	100
1.04413	11.0	6.1	44	1.10092	24.0	13.3	101
1.04831	12.0	6.7	48	1.10193	24.2	13.45	102
1.05252	13.0	7.2	53	1.10275	24.4	13.55	103
1.05667	14.0	7.8	57	1.10367	24.6	13.7	104
1.06104	15.0	8.3	61	1.10459	24.8	13.8	104
1.06534	16.0	8.9	65	1.10551	25.0	13.9	106
1.06968	17.0	9.4	70	1.10643	25.2	14.0	106
1.07142	17.4	9.7	71	1.10736	25.4	14.1	107
1.07404	18.0	10.0	74	1.10828	25.6	14.2	108
1.07580	18.4	10.2	76	1.10921	25.8	14.3	109
1.07844	19.0	10.55	78	1.11014	26.0	14.45	110
1.07932	19.2	10.65	79	1.11106	26.2	14.55	111
1.08021	19.4	10.8	80	1.11200	26.4	14.65	112
1.08110	19.6	10.9	81	1.11293	26.6	14.8	113
1.08198	19.8	11.0	82	1.11386	26.8	14.9	114
1.08287	20.0	11.1	83	1.11480	27.0	15.0	115
1.08376	20.2	11.2	84	1.11573	27.2	15.1	116
1.08465	20.4	11.35	85	1.11667	27.4	15.2	117
1.08554	20.6	11.45	86	1.11761	27.6	15.3	118
1.08644	20.8	11.55	86	1.11855	27.8	15.45	119

CALCULATIONS AND CONVERSIONS

Evaluation of the titratable total acid

In such countries as Switzerland and Germany, the titratable acids of wine are calculated as tartaric acid and are indicated as a decimal in grams per liter. In France and in other Roman countries, the titratable total acid is calculated as sulfuric acid. For fruit and berry juices the titratable total acid is often calculated and indicated as citric acid and malic acid. In order to perform the appropriate conversions, multiply the titratable acid by the factors given in the following table.

The total acid was titrated and calculated as	The total acid is to be expressed as					
	Wine acid	Malic acid	Citric acid	Lactic acid	Sulfuric acid	Acetic acid
Wine acid	—	0.893	0.853	1.2	0.653	0.8
Malic acid	1.119	—	0.955	1.343	0.731	0.896
Citric acid	1.172	1.047	—	1.406	0.766	0.938
Lactic acid	0.833	0.744	0.711	—	0.544	0.667
Sulfuric acid	1.531	1.367	1.306	1.837	—	1.225
Acetic acid	1.25	1.117	1.067	1.5	0.817	—

Enological Guidelines

1. Basic Conversions and Addition Rates
   a. Brix to alcohol conversion factor use 0.60-0.64%,EtOH per °Brix
   b. 1 ton of grapes yields roughly 200 gallons must or 155-175 gallons of juice/wine
   c. Calculate fermentation additions based on total volume (including skins, etc.)
   d. Tartaric additions: 8 lb tartaric/1000 gal adds roughly +0.1 g/100 mL shift in Titratable Acid
   e. Dry ice additions use 7 lb dry ice/ton of grapes to lower 1°F
   f. Water additions:
      i. (initial Brix - target Brix)/initial Brix = % water to add
         Example: Initial Brix = 27
                  Target Brix = 24
         (27-24)/27 = 11% water to achieve target Brix level
      ii. C1V1 = C2V2
         C1 = potential alcohol if all sugar fermented (use 0.60-0.64 conversion rate)
         V1 = initial volume of wine
         C2 = final alcohol desired
         V2 = final volume of wine
         C1V1 = C2V2 Example:
            Current alcohol = 15.53%
            Current sugar = 7,260 mg/100 mL
            Potential alcohol = 19.88% @ 0.60 conversion rate, 60 gallons wine
            (19.88%)(60 gal) = (15.5%) (x gal)
            x = 73.5 gal
            73.5 gals of final wine - 60 gals of initial wine = 13.5 gal of water required to bring total alcohol to 15.5%

ORGANIC WINEMAKING

Listed products may be used in certified organic production according to the USDA National Organic Program (NOP) Rule.

Certified Organic Yeast

EC1118™ Organic

AT-BIO-902 "EU Agriculture"

SGS ORGANIC

Yeast Rehydration and Protection

GO FERM LALLEMAND

OMRI LISTED For Organic Use

GO FERM PROTECT evolution

OMRI LISTED For Organic Use

Yeast Nutrition

FERMAID O™

OMRI LISTED For Organic Use

NUTRIENT VIT™ END

OMRI LISTED For Organic Use

Bacteria Nutrition

OPTI ML® BLANC

OMRI LISTED For Organic Use

ML REDBOOST

OMRI LISTED For Organic Use

Specific Inactivated Yeast

OptiWHITE®

OMRI LISTED For Organic Use

OptiRED®

OMRI LISTED For Organic Use

OptiMUM WHITE®

OMRI LISTED For Organic Use

OPTI-MUM™ RED

OMRI LISTED For Organic Use

reduless®

OMRI LISTED For Organic Use

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OMRI (Organic Materials Review Institute)
SGS is a USDA NOP - Authorized Organic Certifying Agent.

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For more recommendations suited for North American winemaking applications, please visit us at www.lallemandwine.com

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