

Q&A

YEAST - *SACCHAROMYCES CEREVISIAE*

Yeasts are responsible for transforming the glucose and fructose in grape juice into wine and creating many of the myriad compounds responsible for flavor, aroma, and texture.

1. Why are there so many different yeast strains?

There are five fundamental characteristics and most fermentation benefits and/or flaws are impacted by one or more of these:

- Alcohol tolerance.
- Optimal temperature range.
- Nitrogen requirements – low, moderate, and high demand.
- Fermentation kinetics – fast, regular, and slow.
- Sensory attributes – the ability to produce mouthfeel and aromatic compounds.

Just as terroir can differentiate the expressions of a grape varietal, the same goes for yeast. *Saccharomyces cerevisiae* strains have mutated and changed their metabolism in response to the diverse environments of grapegrowing. This explains the multitude of strains both in the wild and available commercially.

When a strain of yeast is known to create great wines in a particular area, it is possible to isolate the yeast in a lab and propagate it. This is the source of many terroir-isolate yeasts on the market; LAFFORT® has many examples from world-famous cellars in multiple regions such as Bordeaux (ZYMAFLORE® F15), Tuscany (ZYMAFLORE® F83), and Champagne (ZYMAFLORE® SPARK).

There are times when additional characteristics are desired, specificity, higher alcohol, or wider temperature tolerance. This

is when crossbreeding is important: a terroir-isolated yeast with great flavor characteristics can be bred with the higher alcohol tolerance from another strain. Look for the “X” in LAFFORT® yeasts (ZYMAFLORE® X5, FX10, RX60, etc.) to find our cross-bred strains. Whether isolated from cellars from around the world, or crossbred, the ZYMAFLORE® range has yeast that express certain qualities to help a wine achieve the goals of the winemaker. The ACTIFLORE® range represents workhorse strains that excel at high-volume winemaking to assure fermentation security.

2. Are there any ingredient interactions to avoid when using *Saccharomyces cerevisiae*?

Only one. Do not add DAP (Diammonium Phosphate) to yeast rehydration water. Ammonia is toxic to yeast cells during rehydration, and the presence of DAP will dramatically affect viability.

3. What happens if I use too little or too much yeast?

Yeast takes time to grow and build up to the levels needed for effective fermentation. Too little yeast allows spoilage microbes to take hold in early stages of fermentation to create off aromas and flavors. Also, if the biomass does not reach sufficient quantity, a cooler fermentation may slow or stop.

SACCHAROMYCES & NON-SACCHAROMYCES YEAST APPLICATION.

OBJECTIVE	YEAST	DOSAGE	NOTE
BIOprotection	ZYMAFLORE® ÉGIDE ^{TDMP} (<i>Torulaspora delbrueckii</i> and <i>Metschnikowia pulcherrima</i>)	2 - 5 g/hL 20 - 50 ppm	On grapes/must.
Mouthfeel and aromatic development	ZYMAFLORE® ALPHA ^{TD} (<i>Torulaspora delbrueckii</i>)	30 g/hL 300 ppm	Initiation of cold soak
Primary fermentation	ZYMAFLORE®, ACTIFLORE® (<i>Saccharomyces cerevisiae</i>)	20 - 30 g/hL 200 - 300 ppm	Initiation of alcoholic fermentation

ACTIFLORE® and ZYMAFLORE® yeasts work famously together with SUPERSTART® BLANC and SUPERSTART® ROUGE

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Too much yeast risks excessive biomass production which can spike temperatures early in fermentation, or consume nutrients too quickly. This would provide insufficient nutrition to complete fermentation, causing stuck fermentations.

When it comes to how much yeast inoculum to use, there is a known 'Goldilocks' zone of 150 - 300 ppm, which varies according to potential alcohol. Rates go up to 500 ppm for restarting stuck fermentations.

4. How do I prepare yeast for inoculation?

One of the best ways to ensure a complete fermentation, with clean aroma, and maximum flavor development is to follow a precise yeast preparation protocol. **SUPERSTART® ROUGE** and **SUPERSTART® BLANC** are recommended to strengthen yeast cell walls and improve metabolism, thereby increasing resistance to alcohol, heat, and toxins while improving aromatics and flavors.

- Use a thermometer and start with chlorine-free water (40°C, 104°F), 20 times the weight of the yeast needed.
- Evenly mix in **SUPERSTART® ROUGE** or **SUPERSTART® BLANC** rehydration nutrient at a rate equal to the inoculation dose of yeast.
- When the temperature is at 37°C (99°F) sprinkle yeast over the surface of the water, mix in gently.
- Let stand for 20 minutes.
- Do not add juice or any ammonium-based nutrients.
- Foaming during yeast rehydration varies greatly according to yeast strain, and is NOT indicative of yeast performance.
- Add enough juice from the must to drop the temperature by 10°C/18°F.
- Wait 10 minutes.
- Repeat the juice addition and 10-minute wait intervals until inoculum is within 10°C/18°F of the must.
- Fully homogenize inoculum into the must.
- Total time from yeast rehydration to inoculation should not exceed 45 minutes.

A thermometer is a key tool for working with yeast, not using a thermometer is one of the primary causes of poor yeast implantation.

5. How can I change fermentation kinetics?

Fermentation speed is based on sugar concentration, temperature, yeast strain, nutrition, and yeast dose rate. In general, fermenting either too fast or too slow may produce off flavors/aromas, and may lead to a stuck fermentation.

Higher sugar musts take longer to ferment. Lower temperatures slow

fermentation kinetics. All things being equal, a ferment at 60°F will ferment slower than at 70°F. This works to the low temperature limit of the yeast when the biochemical reactions in the yeast cell slow and eventually cease.

The biochemistry of each strain dictates the baseline kinetics and this can vary widely. Knowing the kinetics of a particular strain can be used to improve wine quality. For example, **ZYMAFLORE® X5** has a relatively higher kinetic rating compared to **ZYMAFLORE® VL3** making **ZYMAFLORE® X5** more suitable for lower temperatures.

Nutrition can also influence kinetics. Too much nutrition, like too much yeast inoculum, has potential to produce more biomass and increase fermentation kinetics.

6. What factors tell me I have a problem with fermentation?

Any signs of slowing fermentation curve, reduction aromas, or off flavors are good indicators of problem ferments. A successful fermentation will have none of these issues. Some yeast such as **ZYMAFLORE® FX10** have been bred to be less prone to hostile environmental factors and more reliably finish fermentation cleanly.

7. What is the killer factor?

The Killer phenomenon was thought to play an important role in the balance of the microbial population in winemaking but is now considered of very low impact.

Saccharomyces cerevisiae have 'Killer', 'Sensitive', and 'Neutral' strains. Killer strains secrete a protein toxic to the so-called Sensitive strains. Neutral strains do not secrete the killer protein and are not sensitive to the toxin. It has been also established that a Killer strain may be susceptible to another Killer strain. The best-known toxins are K1 and K2. Toxin K1 is a thermo-sensitive glycoprotein with optimum activity in the pH range of 4.2-4.6, while the similar toxin K2 has a wider pH range of 2.8 to 4.8.

The death of 'Sensitive' yeast is not immediate, but the time varies according to the sensitivity of the strain, environmental conditions, the population ratio of Killer to Sensitive yeast and growth stage of the populations. Yeasts in active growth phase are more susceptible to toxins from the Killer proteins than in the stationary phase.

Physical and chemical factors in the environment can affect the activity of the Killer protein toxin. The thermal stability of the toxin is low (with half-life at 32°C (90°F) of 30 minutes) and its Killer activity is related to temperature. pH also plays an important role, and this in synergy with temperature. At pH below 2.9 there is no longer detected activity. Phenolic compounds from grapes have an inhibiting effect, as do additives or auxiliaries such as bentonite or

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enological tannins.

In general, a Killer strain implants quickly and a Sensitive strain more slowly. In a situation where a Killer yeast is added to a fermentation with Sensitive yeast, a high percentage of Killer yeast is necessary to eliminate the susceptible population. Spontaneous fermentations are sometimes dominated by Sensitive strains despite significant proportions of Killer strains.

Detailed data from Bordeaux fermentations, as well as industry observations throughout the world, show that Sensitive strains can be properly implanted in the fermentation of wine, despite a strong representation of Killer strains in the indigenous microflora. Indeed, some of the most popular strains of Laffort range (ZYMAFLORE® VL3, F33, F15) are 'Sensitive', but for more than twenty years, have never showed a problem of implementation.

8. What is a *Bayanus* strain?

Saccharomyces bayanus is an old phenotypical characterization of wine yeast that was originally thought to be a distinct species, stronger than *Saccharomyces cerevisiae* and more effective at completing fermentation. The term is still used today but is not genetically correct.

In 1953, Peynault and Domercq, in the work 'Etudes des levures de la Gironde', described a group of strains often encountered at the end of alcoholic fermentation that were unable to ferment galactose. Due to their presence at completion of fermentation, they were designated as having the best aptitude for fermentation. The name '*Bayanus*' came to represent all strains of yeast that were most efficient at fermentation. After genetic testing became widely available, classically labeled *S. bayanus* strains turned out to be *S. cerevisiae*, with one major difference being the activation of specific gene site, a mutated HXT3 allele, which produces a hexose transport protein. The mutated form (Hxt3p*) is linked with *Saccharomyces* species that are more fructophilic.

Today there is a classified and distinct species of yeast designated *S. bayanus*, which is considered a hybridization of several other yeasts. The true *S. bayanus* is not necessarily fructophilic, and no longer has anything in common with the galactose negative yeasts of the previous era, nor is it used in the wine industry.

The legacy of the old categorization is still evident in the naming of strains like ACTIFLORE® BO213, which has excellent fructose metabolization and is a true *S. cerevisiae*.

9. Are dry pitch yeasts as robust as rehydrated yeast?

Active dried wine yeasts require proper rehydration to be fully effective. Loss of viability if dry-pitched means a yeast may not

properly implant, struggle to establish, and ultimately lead to loss of quality in the resulting wine. With recent advances in yeast crossbreeding, new strains have been discovered that allow for dry pitching to be done. A LAFFORT® technical representative can help determine if a dry pitch yeast is appropriate for any winery.

10. Are there any drawbacks by combining 2 or more different yeast strains at pitch?

Combining different *S. cerevisiae* strains can sometimes create a great outcome. However the greater impact on wine profile will come from whichever yeast had the better implantation in that fermentation, rather than the blend of yeasts.

Variability is generally too high to consistently guarantee reproducibility and thus it is not recommended.

11. How will chitosan react with inoculated yeast?

If used at the maximum legal level of 100 ppm, there is no significant impact on inoculated yeast from Chitosan. There may be a slight reduction in total viable biomass, but not sufficient to influence primary fermentation



ZYMAFLORE® CX9

Chardonnay yeast selected from a unique site in Burgundy coupled with selective yeast breeding.

- Reveals notes of lime, almonds, toasted bread, and fresh hazelnuts.

For wines with **texture** and **aromatic expression**, coupled with **tension** and **volume** on the palate.

