

WHICH COMPOUNDS ARE EFFECTIVE DURING YEAST REHYDRATION?

Rehydrating an Active Dried Yeast (ADY) is a well-known practice in the wine cellar. Add the ADY in lukewarm water, wait, mix, acclimate with must and you are ready to start to start your fermentation tank.

What does specifically happen during this stage? How can it make a difference between a good or bad fermentation? The answer from the yeast's point of view.

Activating the fermenting beauty

An ADY has virtually no water in its cell when coming out of the sachet, reason being that it's in a dormant state. By rehydrating it with water, the yeast can slowly leave dormancy and start activating its metabolism. This is a very delicate step since the yeast is in a transition state and also needs to activate its resistance mechanisms. The main and only element protecting the yeast at this stage is its own cell wall and plasma membrane (Figure 1) separating the inside of the cell from the environment.

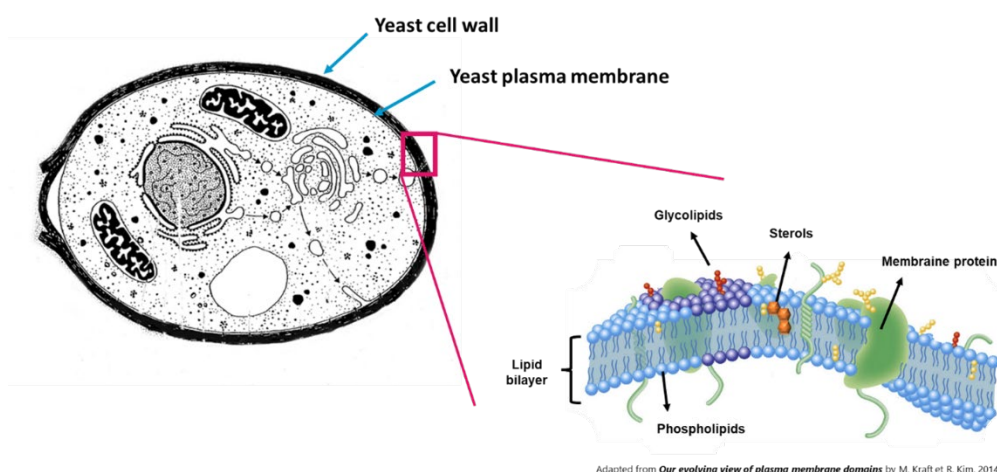


Figure 1. On the left a cross section of a yeast *S. cerevisiae* with its different cellular elements. On the right a schematic representation of the plasma membrane composition.

The plasma membrane is mostly composed of different lipids and sterols and have been shown to play a key role in maintaining the correct structure, fluidity and integrity of the cell (Valero et al., 1998; Luparia et al., 2004; Soubeyrand et al., 2005). If sterols are available specifically during rehydration when the plasma membrane is being restructured, the yeast is able to assimilate and integrate them in its phospholipidic bilayer, further improving the membrane's efficiency. Sterols are the nutrient the yeast can most benefit from during rehydration. As a result, rehydrating an ADY with yeast autolysates rich in sterols, increases the fermentation activity and vitality, not only at the early stages but also during fermentation, and particularly at the end, when alcohol levels become toxic for the yeasts.

What about adding other nutrients in rehydration, is it useful?

One could think that, during rehydration, yeast could benefit from other essential nutrients. **The truth is sterols are the only ones that are essential at this stage when the yeast is focused on reactivating its metabolism and stress resistance rather than fermenting.** Let's see in detail:

- **Sterols:** actively integrated in the membrane if present, increasing its resistance and fluidity, ultimately protecting the yeast right from rehydration step until the end of fermentation. They become particularly crucial at the end of fermentation with the increase in ethanol. In the membrane, they are located around membrane proteins such as specific permeases which will, later internalise the nitrogen sources, sugars, aroma precursors, optimising yeast activity and metabolism.
- **DAP:** inorganic nitrogen source suited for yeast growth and fermentation speed, **which is not the yeast's focus during rehydration stage** and therefore not useful. Known for easily creating nutritional unbalances and leading to off-flavours if added at the early stages of fermentation, it is one extra reason to avoid its use during rehydration.
- **Amino acids:** organic nitrogen source that, although balanced and beneficial for the yeast activity even in early stages, makes more sense when the yeast is actively fermenting in the must. **The yeast will not benefit from amino acids during rehydration**, since, among other roles, nitrogen is most important to uptake sugars, not yet present during rehydration.
- **Vitamins and minerals:** essential micro-nutrients from which the yeast always benefits from. Can be beneficial for metabolism optimisation during rehydration, also taking advantage of the absence of natural flora competition. Nevertheless, their major benefit comes at the fermentation start or at mid-fermentation when they help optimising yeast fermenting metabolism and aromatic contributions.
- **GSH:** glutathione is an excellent anti-oxidant organic element however most useful in pre-fermentative stages to help protect the must from browning and losing the aromas and quality. **No interest for the yeast during rehydration** since it's rehydrated in water, a neutral and low oxidative environment. Additionally, the relative short rehydration time doesn't allow glutathione to be assimilated or have any positive impact on cell ageing or stress resistance during this particular stage.

To summarise:

Nutrients	Rehydration	T0 AF	T1/3 AF	End AF
Sterols				
DAP				
Amino acids				
Vitamins and minerals				

Table 1. Visual representation of the importance of different nutrients at the different stages of fermentation. The bigger the circle, the bigger the benefit for the yeast and wine fermentation.

Dosage at the rendez-vous

When rehydrating a yeast, the cell concentration is very high, near 200 million cells per liter! That means a lot of yeasts to take care of to better protect them. In the case of sterols, **Lallemand Oenology's protectors are recommended at an average dosage of 25 g/hL of ADY to 30 g/hL of protector. The reason behind such ratio is to promote a high contact between sterols and the membrane, needed for their proper assimilation**, especially in such a short period as rehydration. It was demonstrated in the particular case of the protector GO-FERM STEROL FLASH™ that 15 mins of contact (even in cold water) are sufficient but mandatory to promote high sterol integration for getting the best membrane integrity and resistance to alcohol. The sterol content in the fermenting yeast can increase up to 4 times more when respecting the correct ratio and timing (Figure 2). **Below this dosage and sterols concentration, the efficiency of any other protectors or nutrients from any other suppliers used during rehydration will be low to non efficient.**

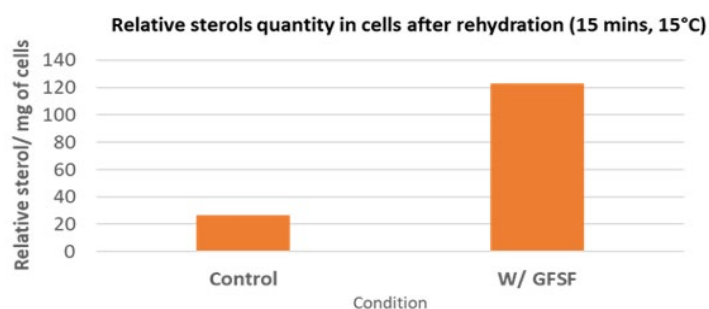


Figure 2. Sterol concentration measurement in the plasma membrane of isolated and living yeast cells after a rehydration in water of 15 mins, with and without the protector GO-FERM STEROL FLASH™.

The rehydration revolution with GO-FERM STEROL FLASH™

As a delicate and crucial step, ADY rehydration should be performed in the most optimal conditions: 37 °C, minimum 20 mins with soft agitation and proper acclimation to the must before inoculating the tank. Thanks to our R&D team and production efforts, a revolutionary protector, GO-FERM STEROL FLASH™, was recently released, allowing a great simplification of rehydration protocol. GO-FERM STEROL FLASH™, composed of a **100% yeast autolysate**, has the particularity of being **microagglomerated** and **highly concentrated in sterols**. Thanks to this high level of sterols, an efficient yeast rehydration can be achieved at low temperature. The new form allows an instant dissolution of its high sterol content, which by being readily available for the yeast to assimilate, **even at cold temperature (> 15 °C)**, increases even more the protection levels. Because of this extra and reinforced protection, the rehydration protocol can be safely simplified such as using tap water temperature or the no need of acclimation. Only in a GO-FERM STEROL FLASH™ rehydration scenario these simplifications can be applied due to the optimised and strong sterol protection that ensure a high level of fermentation security and wine quality.

GO-FERM STEROL FLASH™ IS THE MOST EFFICIENT AND RELIABLE YEAST PROTECTOR AT COLD REHYDRATION TEMPERATURE, PROVEN AND TESTED, FOR YEAST EFFICIENCY AND SENSORY EXPRESSION



WINE YEASTS



WINE BACTERIA



NUTRIENTS /PROTECTORS



SPECIFIC YEAST DERIVATIVES



ENZYMES



CHITOSAN



VINEYARD SOLUTIONS