Natural Solutions that add value to the world of winemaking / www.lallemandwine.com

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Acids are very important structural components of wine. If a wine is too low in acid, it tastes flat and dull. If a wine is too high in acid, it tastes too tart and sour. Usually, the winemaker can easily manipulate the acidity.

1 Acidity in Wine

Total acidity (TA) of a wine allows determining a value for acidity that is consistent to predict wine taste and possible issues such infection and spoilage by microorganisms. Most red table wines are about 0.6% total acid while white wines are usually a little higher.

Although total acid and pH are related, they represent different ways of measuring acidity of wine. If the pH of a wine is too high, 4.0 or above, the wine becomes unstable with respect to microorganisms. **Low pH inhibits microorganism growth.** Tartaric acid is often added to fermenting grape juice in winemaking to insure that an acceptable final pH can be realized, since some acid is lost during fermentation thus reducing the total acidity and raising the pH.

Link in between acidity and alcohol in Wine

With global warming and changing weather patterns, the fact that acidity levels are decreasing and that alcohol level are increasing in wine in the last 2 decades in most wine producing areas is a proven fact and concern for winemaking process.

Wine with more alcohol and less acidity make that they will not have the ability to age as they usually did in the past.

The winemaker can intervene on canopy management and or in the cellar using equipment to control these two parameters in pre and post fermentation. These heavy practices are often costly and not always completely satisfactory.

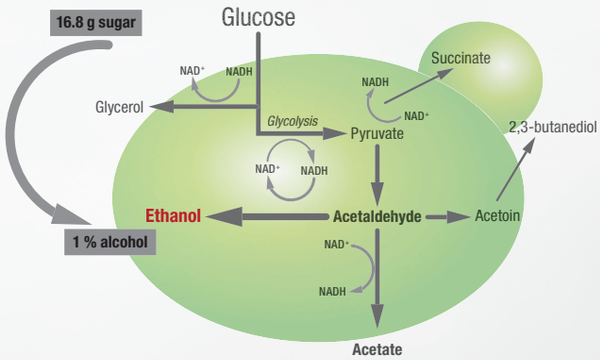
pH and acidity during alcoholic fermentation and yeast metabolism

During alcoholic fermentation, total acidity globally decreases particularly because of tartaric acid crystallization, ethanol production and yeast malic consumption.

With the production of ethanol and to maintain its intracellular pH and optimize its metabolism, the yeast will excrete proton in the media, which will impact pH.

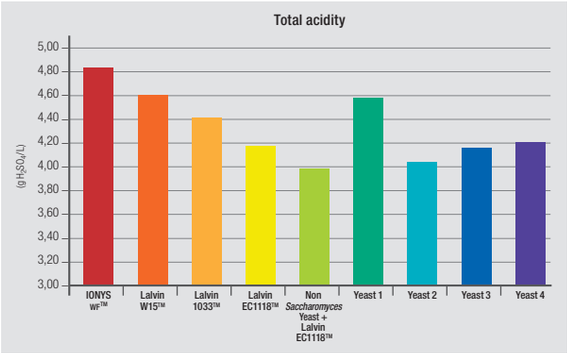
On the other hand, there are also biomass synthesis and other metabolites such as organic acids (succinate) which will also impact the pH.

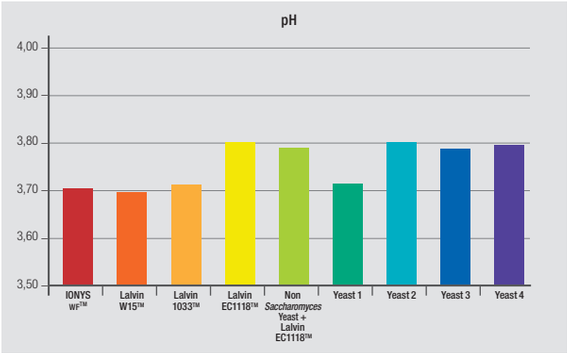
Wine yeast metabolism: intracellular redox balance



2 IONYSWF™ : A yeast solution to keep must acidity during fermentation

IONYSWF™ is the first wine yeast that has been selected within the *Saccharomyces cerevisiæ* species for its capacity to significantly and naturally acidify must during fermentation, compared to most others selected wine yeast known for their properties to keep acidity and low pH.



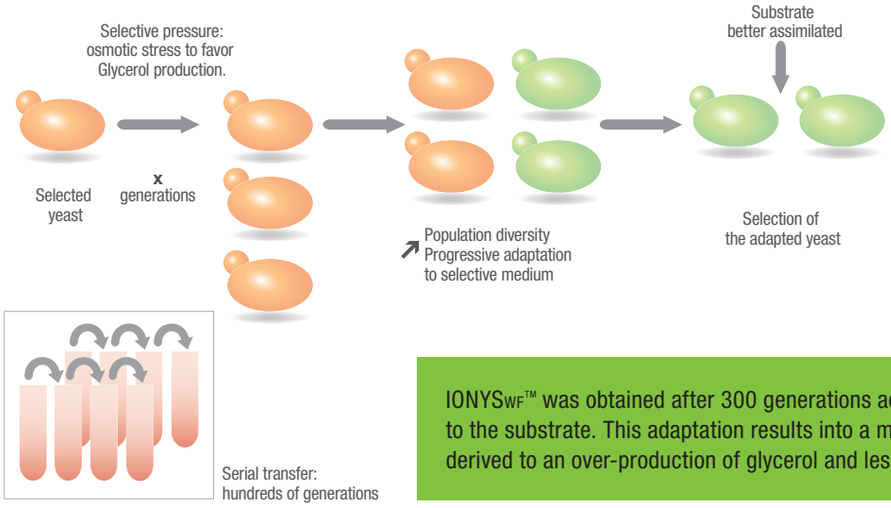


3 Why IONYSWF™ is so unique?

IONYSWF™ is the result of a collaborative research project between Lallemand and INRA Montpellier, France *(Institut National de la Recherche Agronomique)*. The aim of this collaboration was to select a wine yeast better adapted to the global warming conditions. The strategy used, called "evolutionary adaptation", allows to generate yeast progressively adapted to these high osmotic pressure conditions. The goal is to select yeast over-producing glycerol and so showing a reduced sugar ethanol yield conversion.

Tilloy V; (April 2013) *Développement de nouvelles souches de levures œnologiques à faible rendement en éthanol par évolution adaptative. Thèse Montpellier SupAgro.*

EVOLUTIONARY ADAPTATION: PRINCIPLE



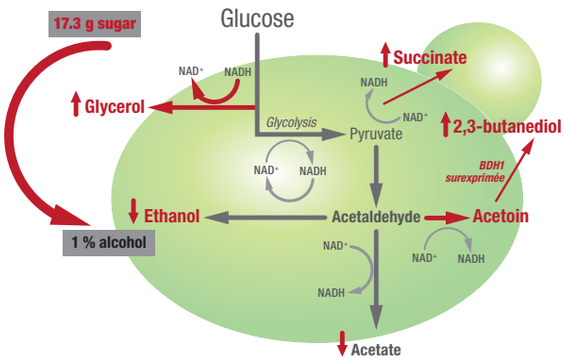
IONYSWF™ was obtained after 300 generations adapted to the substrate. This adaptation results into a metabolism derived to an over-production of glycerol and less alcohol.

4 Results

A *Saccharomyces cerevisiae* yeast with a very special and unique metabolism over-producing glycerol and **organic acids**.

While most of the wine yeasts will need to consume 16,8 g of sugar to produce 1% of alcohol, IONYSWF™ will need to consume 17,3 g to produce 1% of alcohol.
This particular metabolism makes it specially adapted to ferment high maturity grape must, thanks to its capacity to retain acidity and its low sugar/alcohol conversion.

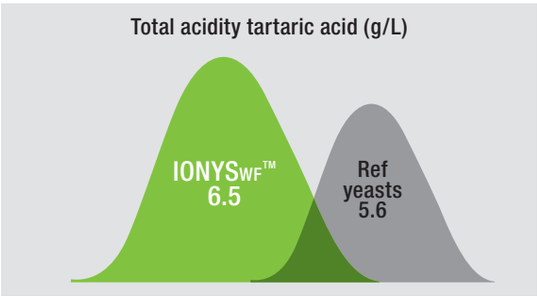
A special and particular metabolism: IONYSWF™



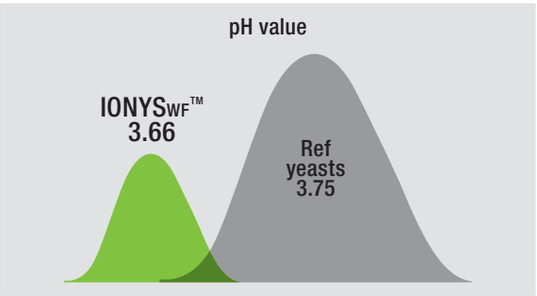
IONYSWF™ is an innovative yeast selection: International Patent Pending N° WO2015/114115.
DEQUIN Sylvie, TILLOY Valentin, ORTIZ-JULIEN Anne, NOBLE Jessica.
Method for obtaining low ethanol-producing yeast strains, yeast strains obtained therefrom and their use.

5 Evidences

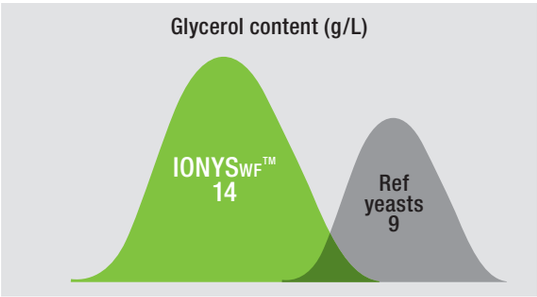
Average value results from over 30 winery trials conducted with IONYSWF™ v's other commercial wine yeasts in same conditions.



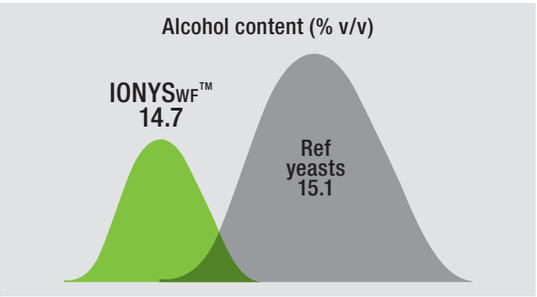
Total acidity difference observed: +0.4 to 1.4 g/L tartaric acid



pH difference value observed: -0.04 to -0.2



Glycerol over production observed
(till 17 g/L vs 8 g/L for the reference yeast)



Alcohol difference observed: 0.4 to 0.8 % v/v

6 IONYSWF™ : A unique strain for well-balanced wines

Adapted to red wine fermentation, IONYSWF™ is an essential tool to obtain wines with more balance and freshness.

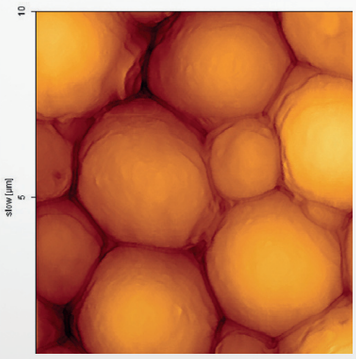
- High acidification power: Total acidity difference: +0.4 to 1.4 g/L tartaric acid / pH decrease: 0.04 to 0.2
- High glycerol production (up to 15 g/L)
- Low alcohol producer (0.4 - 0.8 % v/v in winery conditions Vs other commercial wine yeasts used in same conditions)
- Very low volatile acidity production
- Very low SO_2 production
- Ethanol tolerance: 15.5% alcohol
- Nitrogen requirements: Very high (appropriate nutrition is required)
- Long but steady stationary phase
- Optimum range of T° : 25 to 28°C

7 How to use IONYS™ WF ?

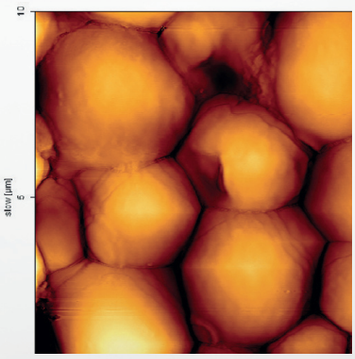
Instruction of use

Higlhy recommended to inoculate IONYSWF™ as soon as rehydration is done to ensure a good implantation.
At receival, SO_2 level should be ≤ 4 g/hL.
In high maturity conditions (high potential alcohol) in order to protect yeast against osmotic shock, the use of GO-FERM PROTECT EVOLUTION™ (30 g/hL) is highly recommended during the yeast rehydration phase.

1. Suspend 30 g/hL of GO-FERM PROTECT EVOLUTION™ in 20 times its weight of clean 43°C water.
2. Once the temperature of the GO-FERM PROTECT EVOLUTION™ solution has dropped to 40°C, add 25 g/hL of IONYSWF™. Stir gently and wait for 20 minutes.
3. Add to the must. The temperature difference between the must to be inoculated and the rehydration medium should never be over 10°C (if any doubt, please contact your supplier or Lallemand).
4. The total rehydration duration should never exceed 45 minutes.
5. It is essential to rehydrate the yeast in a clean container.
6. The rehydration in must is not advisable



With GO-FERM PROTECT EVOLUTION™



Without GO-FERM PROTECT EVOLUTION™

8 Nutrition is a key point when using IONYSWF™

Well-balanced nutrition is of primary importance to the wine yeast during fermentation (Fermaid O™ is the latest nutrient developed by our winemaking nutrient research team).

1- First addition of Fermaid O™ at the end of the lag phase

2- Second addition of Fermaid O™ around 1/3 sugar depletion (the end of exponential growth and the beginning of the stationary phase)

Note: in condition of nitrogen deficiency, yeast assimilable nitrogen may be insufficient to avoid fermentation issues. Refer to the following recommendations table chart.

Yeast assimilable Nitrogen (mg/L)	First addition	Second addition at 1/3 of AF
> 140	Fermaid O™ 15 g/hL	Fermaid O™ 15 g/hL
< 140	Fermaid O™ 30 g/hL	Lallemand complex nutrients 25 g/hL

FAQ

Why is IONYSWF™ producing more total Acidity?
Initially, this yeast was selected for its ability to overproduce glycerol. In the yeast cell, and during glycerol synthesis, other intracellular pathways are overexpressed or on the contrary, can be repressed. This is how yeasts naturally control their intracellular redox balance. Among the metabolites produced by this metabolism, some organic acids are overproduced such as succinic acid, α-keto-glutarate, pyruvate and malic acid.
During the selection process, the yeast has been adapted on a high specific media which would mimic an osmotic stress to the cells and to induce overproduction of glycerol. This adaptation mechanism leads the yeast to develop a specific metabolism towards this specific media: the result is adapted cells that have the ability to naturally internalize potassium and by doing so, lower its content in the must in fermentation, avoiding precipitation with tartaric acid.

Is it A GMO?
No, it's a yeast selected through evolutionary adaptation, which is a natural process.

Could I use it on White and Rosé?
Yes, but the optimal range of T° fermentation for such yeast is between 25 and 28°C. Optimal impact on alcohol decrease has been observe in this temperature range.

Any issue with MLF?
IONYSWF™ is compatible with wine bacteria.

Is there a sensory impact from organic acids produced and the glycerol?
High glycerol level and organic acid production combined with the lower sugar conversion into alcohol all participate to the volume perception in mouth, and balance the acidity with an overall freshness of the wine.

Does the behavior of yeast depend on the initial must acidity?
Even if IONYSWF™ will maintain its ability to produce more organic acids, its recommended for musts with pH>3.5 where this acidification is more interesting.

Will I always have an ethanol decrease of 1.3 % as claimed by the INRA on a 16.5 % v/v potential alcohol wine?
Thanks to its specific metabolism, IONYSWF™ has this capacity to convert sugar into less alcohol than most of the other *Saccharomyces cerevisae* wine yeasts, but under specific conditions.
In our winemaking trials (over 30), the average decrease was between 0.4 % and 1 %.

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