



GOOD AF MANAGEMENT



LAFFORT

l'œnologie par nature

1- Why manage AF?

In modern vinification it is crucial to reach a product objective in terms of a stylistically well-defined and reproducible wine in order to meet market requirements. This necessitates **complete control** of the winemaking process and, first of all, the alcoholic fermentation (AF).

The inoculation of a selected yeast strain represents a perfect tool to manage the initial stage of fermentation. Leaving the AF to indigenous yeast populations introduces risk regarding both the fermentation (stuck AF, increased VA...) and the wine's aromatic profile (deviations).

Whilst the selection of the yeast strain according to the product objective and its vinification parameters is essential, it is also crucial to ensure its implantation in the medium, plus its nutrition and viability in order **to guarantee a smooth fermentation until completion**.

2- Controlling the indigenous flora

After inoculation, yeast must acclimatize to the medium (sugar content, etc). This **lag phase** corresponds to the theoretical time of two cell generations (Le levurage en Œnologie, Cevilar). The generation time varies according to several factors, such as the strain and the medium conditions. Amongst the latter, **temperature** plays a major role. At 15°C, yeast require on average 6 - 8 hours in order to multiply, whereas they only need 4 hours at 20°C. Thus, it is important to maintain non-inoculated musts at cold temperatures.

Finally, the higher the **ADY/indigenous population ratio**, the easier the implantation of the inoculated active dry yeast (ADY) will be: a factor of 10 (i.e. the ADY population is 10 times higher than the population of indigenous yeast) only ensures the implantation of 60 to 90% of the ADY, whilst **a factor of 100** increases the implantation success to 98%. Thus, it is essential to carry out early yeast inoculation in order to dominate the indigenous flora (Le levurage en Œnologie, Cevilar).

3- How to optimize yeast inoculation?

In spite of maintaining cellar hygiene before and during the entire harvest process, a large quantity of indigenous yeasts stemming from the grapes and the cellar can be present during vinification. Thus, it is necessary to inoculate the yeast as soon as possible after tank filling in order to guarantee the survival and implantation of the selected yeasts (in the case of prefermentation cold maceration (cold soaking), see §3.2).

3-1 Selection of the yeast strain

Whilst the first commercialized ADY were designed to ensure the completion of the AF and to minimize the development of unwanted compounds (such as VA and H₂S), modern commercialized strains offer the extra dimension of specific organoleptic characteristics in addition to the aforementioned fermentation qualities.

The expression or production of aromas, the production of glycerol and low colour adsorption are criteria that distinguish these yeasts. Additionally, certain yeasts are "POF(-)", i.e. they do not have the enzyme which leads to the production of vinylphenols, therefore allowing the production of elegant and clean wines.

Thus, the selection of a yeast strain is a crucial stage in determining its technical itinerary. To this end, winemakers must consider several factors:

- the quality of their grapes/must
- the stylistic objective of the wine (in line with the market)
- any logistical restraints imposed by the technology available in the cellar.

The analysis of these three parameters will allow appropriate selection of the strain according to its fundamental qualities: white/red/rose, resistance to alcohol and temperature, aroma or gustatory qualities...

Once the yeast strain is selected, it is also necessary to ensure the quality of the ADY. If the population and activity are insufficient, sluggish or stuck fermentations increase in likelihood, which can lead to microbial deviations (*Brettanomyces*, lactic spoilage).

3-2 Yeast inoculation timing

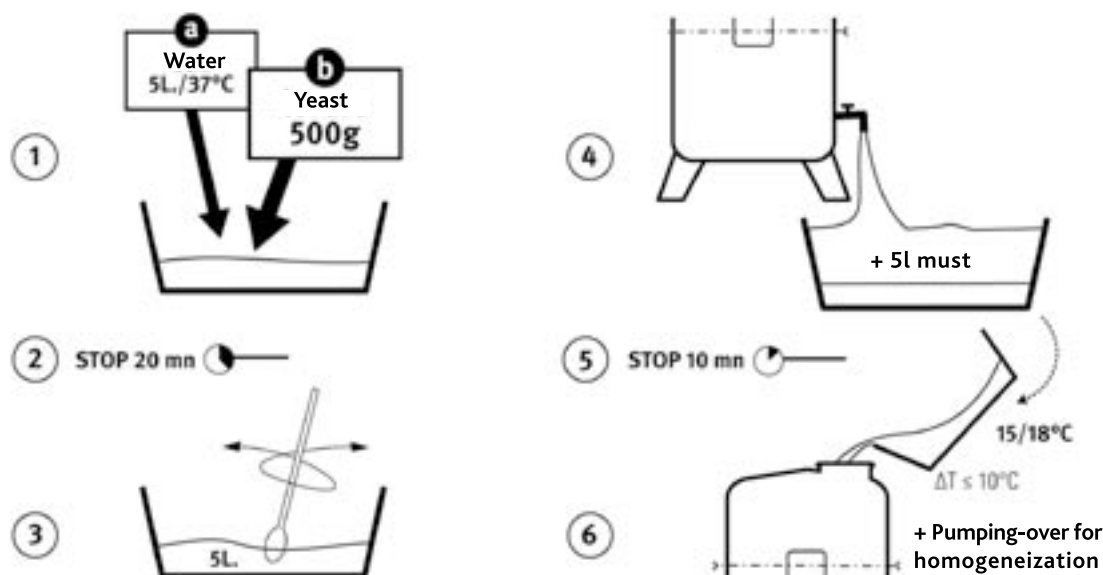
Overall, it is essential to inoculate AS SOON AS POSSIBLE. A late inoculation not only leads to a colonization (partial or total) of the medium by the indigenous flora, but also to the consumption of valuable nutrients (minerals, vitamins, sterols, etc), which then would be unavailable to the selected yeasts. **Enumeration of the indigenous flora** by epifluorescence microscopy allows the evaluation of the microbial load and, if necessary, to remedially adapt the prefermentation operations and the inoculation time.

In white winemaking, the yeast is added just after clarification. With reds, it is necessary to inoculate the yeasts as soon as possible after tank filling. In the case of prefermentation cold macerations (PCM), it is recommended to add part of the total yeast inoculum to the must before PCM. The addition of 5 to 10 g/hl of yeasts at tank filling will not induce fermentation during this step if the temperature is well managed, but it will favour the implantation of the selected yeasts. At the end of the PCM, add the remainder of the yeast: 10 to 15 g/hl.

3-3 Protocol for the yeast inoculation

A few essential rules have to be followed. The inoculation has to be performed in a **clean container**, by adding in the following order: **water at 37°C**, the yeast booster such as Superstart/dynastart (See the technical booklet on the management of fermentation activators), then the ADY at the rate of **20g/hL**. The addition of must during this first step is to be avoided, as it would supply an acclimatized and active indigenous flora during the rehydration stage of a still vulnerable ADY. The ADY should be rehydrated for **20 MINUTES**. The addition of sugar at the beginning is not necessary since the yeasts do not metabolize it during this phase. Some authors describe the positive effect that the addition of sugar has in maintaining the osmotic pressure of the rehydration medium. The decision regarding sugar addition will be left to the winemakers, however this addition should never be performed using fresh must.

On the other hand, a **TEMPERATURE DIFFERENCE** (between the starter and the tank to be inoculated) of more than **10°C** highly jeopardizes the survival and implantation of the selected yeasts. Thus, the starter temperature has to be lowered with successive must additions in order to approach or attain the tank temperature. In any case, it is important that the total preparation duration (rehydration + must addition to decrease the inoculum temperature) does not exceed **45 MINUTES**. Once the yeast has been inoculated into the tank, it is recommended to perform a pump-over for homogenization.



To ensure a well managed yeast inoculation, it is recommended **to control the status of the implantation** at, for example, the beginning, middle and end of the fermentation. A genetic method allows verification of whether the inoculated yeast has totally colonized the medium or has been contaminated by one or several other indigenous strains.

3-4 Using a yeast propagation as starter (pied de cuve)

The propagation of yeasts in must and the addition of fermenting must are ***absolutely not recommended*** for several reasons. First, while the yeasts can multiply, the aeration in the cellar during propagation is insufficient to allow an adequate production of sterols for membrane integrity. Moreover, the strain purity of the initial must is not guaranteed, and this can place the ADY in a situation of competition and increase the risk of cellar contamination by unwanted yeasts. Finally, when adding a fermenting must to inoculate a tank, it is difficult to manage and reproduce the yeast population level and physiological status.

3-5 Ensure the protection of the yeasts for inoculation

The yeasts, which will be added to musts with very high sugar concentrations or to those which are highly clarified have to be prepared to survive the difficult conditions of the medium. Sterols are mainly responsible for maintaining membrane integrity. The addition of yeast sterols (such as those found in Superstart/Dynastart) during rehydration allows a significant increase in cell viability at the end of AF.

3-6 Ensuring the nutrition of yeasts during AF

The fermentation rate depends, amongst other factors, on the quantity of nitrogen available to the yeasts. A tailored addition of activators will ensure a smooth fermentation until completion, and will also positively influence the course of a subsequent malolactic fermentation (See the technical booklet on activators and MLF management).

The analysis of the must, specifically with regards to the potential alcohol degree and the amount of assimilable nitrogen, is essential. This analysis will determine the additions of ammonium phosphate or sulfate (such as Thiazote), or even more complex activators.

4- What are the other keys for a successful AF ?

4-1 The temperature

The temperature is very important to obtain the desired wine aroma profile, but it also affects the yeast. A high temperature at the beginning of AF (approximately 28°C) inhibits cell multiplication. An excessively elevated temperature at the end of AF (between 28 and 30°C) is also to be avoided, as it acts in synergy with alcohol and negatively affects the cell viability. Finally, brutal variations and thermal shocks have to be prevented as much as possible when inoculating and during the entire AF.

4-2 The aeration

Oxygen management is essential to successfully complete AF, since oxygen is necessary to synthesize the membrane sterols of the yeast, which are involved in the resistance to alcohol. With white vinifications, two situations have to be considered:

- **Fermentation in the presence of oxygen.** If the must has high turbidity, a careful oxygenation is recommended (approximately 8 mg/l). This operation can take place in two stages, at specific gravities (10,8 and 8,3 Baumé). At these stages, the CO₂ generation is important and protects the must from oxidation (specifically the oxidation of aromas).
- **Fermentation without oxygen.** In a highly clarified must, any oxidation caused by aeration would be more damaging for the must than advantageous for the yeasts. The absence of a sterol source can be compensated for by adding inactivated yeast based complex nutrients, which are a source of sterols (Superstart/Dynastart, Bioactiv).

With red vinifications it is recommended to oxygenate during pumping-over at the beginning of the AF, to promote yeast growth but also for colour stabilization.



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