Microbiological stability

Key factor to master the aging of wines

The practices used during the winemaking and aging process (MLF, use of sulfites, etc.) play a determining role in the microbiological stability of musts and wines. Some microorganisms called microbial flora of alteration can indeed, if the conditions are met, develop and harm the organoleptic quality of the product. This is why microbiological control tools are used. Among them, sulfur dioxide (SO2) is the most common, but its use is less and less popular due to the potential allergenic risk. The regulations concerning the doses of sulfites in wines and the expectations of consumers have evolved and encourage the wine industry to study alternative methods to guarantee the microbiological stability of wine. Two of them are presented below.

OENOVEGAN® MICRO

Unlike bioprotection, which consists of colonizing a medium in the pre-fermentation phase with selected microorganisms to limit the development of other species, biocontrol aims to slow down and reduce the overall microbial diversity of the must. This ensures lasting protection against contamination, but also facilitates the development of yeasts of interest (limiting competition) because *Saccharomyces cerevisiae* is a species that is not very sensitive to chitosan, the active compound used in this solution.

Alternative to SO_2

Clear and intense aromatic profile

Controls *Brettanomyces bruxellensis* population

Chitosan, an interesting molecule for microbiological stabilization - but why?

Chitosan is a polymer derived from chitin contained in the cell wall of microorganisms such as *Aspergillus niger*. Positively charged in an acidic environment (ph<5.5), its molecule reacts by electrostatic attraction with negatively charged compounds contained in the walls of microorganisms, leading to membrane dysfunction and cell death.

This directly impacts:

- Lactic acid bacteria (GRAM+) through interactions with membrane liposaccharides,
- Acetic bacteria (GRAM-) by interactions with the techoic acids of the peptidoglycans of the cell wall,
- *Brettanomyces bruxellensis* and other yeast species by interaction with mannosylphosphates and sphingolipids of the membranes.

However, chitosan does not affect the kinetics of alcoholic fermentation thanks to the particular metabolism of *Saccharomyces cerevisiae*. (Figure 1.)

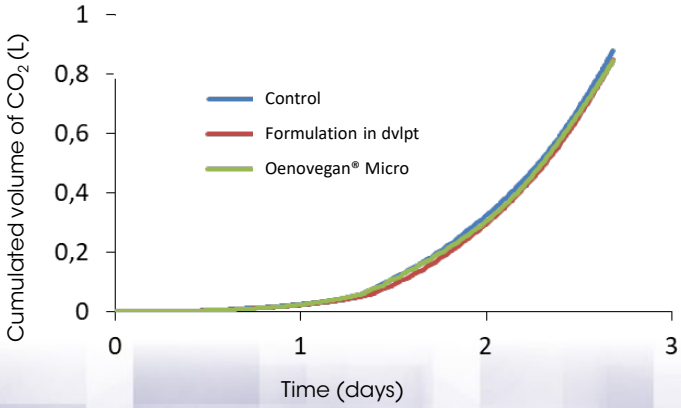

Figure 1: *Impact of chitosan on the fermentation kinetics of Saccharomyces cerevisiae. Monitoring of CO2 release. Comparison between untreated control, Oenovegan® Micro and a product under development.*

APPLICATION

Used on grapes and musts before alcoholic fermentation:
- reduces the diversity of micro-organisms and allows the management of wild populations
- promotes better fermentation kinetics

Used on wines after alcoholic fermentation or malolactic fermentation:
- Curative: eliminates *Brettanomyces*
- Preventive: controls spoilage microorganisms

The manufacturing process in the form of granules for immediate dispersion guarantees a great speed of action and an elimination of *Brettanomyces* in 3 to 4 days where other products on the market require about 15 days.

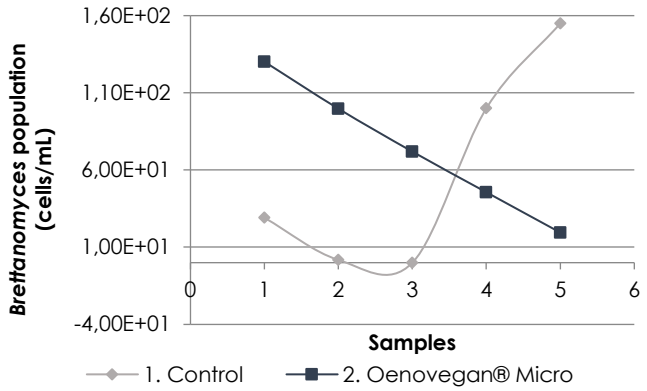

Figure 2. Growth of the *Brettanomyces* population during winemaking (Merlot, Bordeaux, 2019). Analysis by qPCR.

Recommended dosage: From 2 to 40 g/hL depending on the microbiological risk.

Maximum legal dose according to current American regulations: 500 g/hL (Allowed by the TTB - GRAS Notice No. GRN 000397 of 7/15/2021).

Table 1. Dosage and impact for several microorganisms.

Microorganism	Dosage and impact
Brettanomyces	3 – 15 g/hL – Eliminated
Zygosaccharomyces	> 2,5 g/hL – Reduction of population
Acétobacter	20 – 40 g/hL – Eliminated
Lactobacillus	5 – 20 g/hL – Eliminated
Pediococcus	> 10 g/hL – Reduction of population

DIWINE® Affinage - Limit the impact of *Brettanomyces*

DIWINE® AFFINAGE benefits from the double function of the PVP/PVI in its composition: on the one hand, it adsorbs the phenolic acids precursors of ethyls and vinyls phenols produced by *Brettanomyces* and responsible for organoleptic deviations (leather, animal) and, on the other hand, it traps the excess of heavy metals responsible for the premature evolution of the wine (color and aromas which go from fresh to compote). Moreover, the presence of IDY allows the autolysis of these to bring more volume and structure to the wines. Used between fermentations or after malolactic fermentation, DIWINE® AFFINAGE allows to obtain fruity and supple red wines.

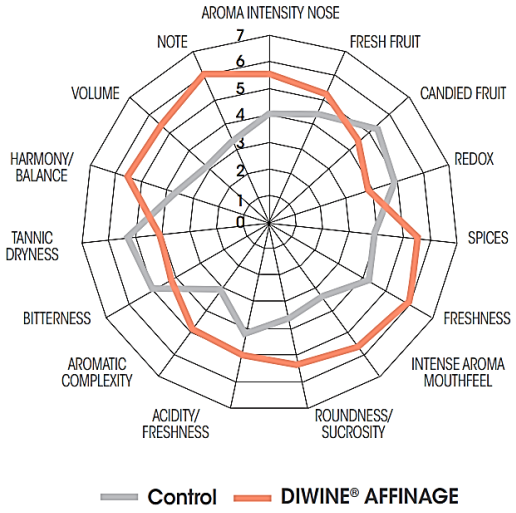

Figure 3. Sensory analysis performed on Syrah red wine (2017) after malolactic fermentation with and without addition of 20 g/hL of DIWINE® AFFINAGE.