Red for every season

TECH POINT

HOW TO MAKE FRESH, EASY TO DRINK RED WINES?

WINE IS ALSO IMPACTED BY CLIMATE CHANGE

The impact of climate change on vines has been studied for decades in multiple wine regions worldwide. It is now clear that climate change plays **a key role in the development of vines**, the composition of the grapes they produce and the quality of the wines made from them.

Climate change, marked by increasingly higher annual temperatures, directly impacts the phenological maturity of vines and **brings forward the maturity-harvest date**. It particularly affects the end of the cycle between veraison and maturity when organic compounds that contribute to the balance and organoleptic quality of the wines (sugars, acids, polyphenols responsible for aromas and structure) are synthesized. Thermal and hydric stress experienced by vines during periods of drought in late summer not only brings forward the **maturation stage, but also shortens it**. As a result, sugar concentrations in the berries get higher while acid concentrations get lower. Consequently, wine quality and typicity are changed. **Present-day vinified wines have increasingly higher alcohol content and less marked acidity.**

Alongside technological maturity (sugars, organic acids, polyphenols), **aromatic maturity is also out of step**. Because the maturity phase is shorter and subject to higher temperatures, aroma synthesis is curtailed and the aromatic expression of the wines is not as intense.

THE FIRST LEVER FOR MAKING FRESH, EASY TO DRINK WINES: THE VINE

To keep producing supple, delicious red wines, **oenological goals must be defined right from the start – at the vineyard**, where we can find the first levers to combat the consequences of climate change. It is possible to **optimize 'grape potential'** by providing the vines with **the nutrients they need to resist abiotic stress or to ensure the synthesis of aroma precursors and polyphenols** that are essential for high-quality wine. Providing nutritional correction from the earliest phenological stages enables you to offset imbalances that impact key mechanisms like flowering and veraison.

Vine — oenoterris — **Nutritional biostimulants for vines**

		Effects on vines	Oenological impact
AFTERWARD	oenoterrisfleur	Nourishes, rebalances and unblocks to ensure good flowering	Uniform phenolic maturity, optimized aromatic potential
	oenoterrisexpression	Better berry growth and polyphenol synthesis	Enhanced color and structure potential and higher ester concentrations

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WHAT ARE THE KEYS TO THE DRINKABILITY OF RED WINES?

HOW TO ACHIEVE MICROBIOLOGICAL BALANCE

Higher must pH is a consequence of climate change that translates into **lower acidity**. This in turn promotes the development of microorganisms indigenous to the grape. SO_2 has traditionally been used as an antiseptic and antimicrobial agent, but beside the controversy surrounding its allergenic properties it is **not always sufficient to clean the medium when pH levels are high** – some strains of *Brettanomyces bruxellensis*, for example, are resistant to it. **Alternative chitosan-based solutions** like **OENOVEGAN® MICRO FA** help reduce fungal diversity, including that of non-*Saccharomyces* yeast populations, and improve the **microbiological stability** of must (Figure 1).

Microbiological protection

OENOVEGAN® MICRO FA

Synergistic combination of chitosan and yeast hulls to control microbial diversity in must.

- Limits the growth of spoilage microorganisms
- Tested and validated in cold maceration
- Enables you to obtain a clearer aromatic profile

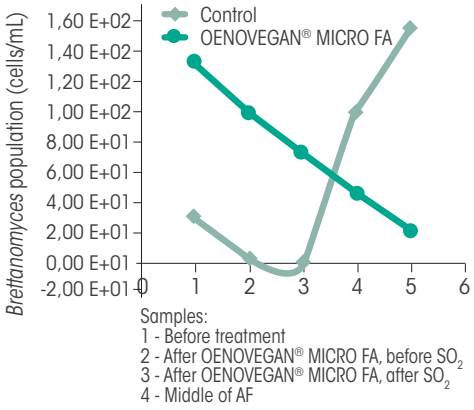

Figure 1. *Brettanomyces bruxellensis* population growth during vinification of red must (Merlot). Analysis by qPCR. Control is sulfited.

REVEALING AROMAS

Vitamins are **essential compounds in yeast metabolism**, where they are involved in multiple key reactions. The most recent studies have provided more precise information on the major role they play in yeast and its **preferential needs**. More generally, OENOFRANCE® has been able to observe their **impact on alcoholic fermentation** and certain **routes of aroma synthesis**.

The excessively high temperatures that sometimes occur in summer change the composition of musts, and the observed bioavailability of vitamins is increasingly lower. Given their importance, it is advisable to readjust the must with **CLIMAX® PRIME** thanks to its carefully identified vitamins (Figure 2).

Rebalancing the must

CLIMAX PRIME

Yeast autolysate to ensure the bioavailability of vitamins in musts.

- Completes the availability of the vitamin pool in the must
- Ensures yeast growth and the smooth progress of fermentation
- Targets a current problem and responds to a future challenge

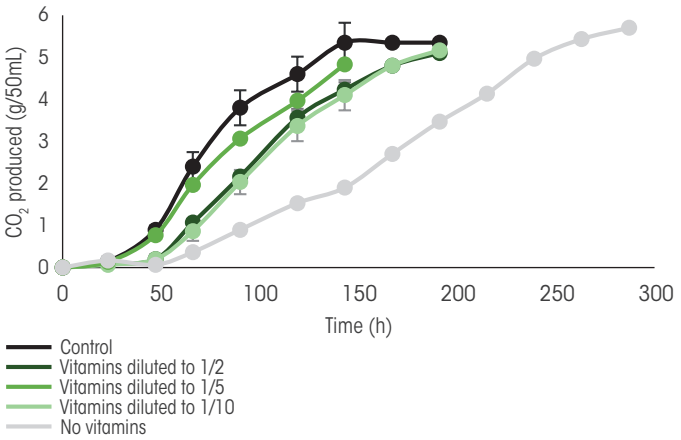

Figure 2. Monitoring of the fermentation kinetics of a selected strain of *Saccharomyces cerevisiae* yeast inoculated at 20 g/hL in the presence or absence of more or less diluted vitamin pool. Results subjected to statistical analysis (Kruskal-Wallis; p<0.05).

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The impact of thiols on the aromatic profile is more complex to explain in red wines than in whites and rosés. Unlike with the latter, this impact is not a mere aromatic contribution of 4-MMP, 3-MH or A3MH to the typical aromas of boxwood, citrus or exotic fruit.

Recent studies show that it is **the interaction of these thiol molecules with each other or with other families of molecules** such as furans (furanediol: ripe strawberry, candied fruit), terpenes (β-damascenone: rose, red fruits) or esters that contributes to the overall aroma of wines. **The aromatic compounds act as vectors or carriers of aromas, amplifying or modifying the wines' aromatic profiles.** These ae the mechanisms that contribute to the aromatic complexity and fruity expression of red wines.

The interaction of the various aromatic molecules produced by **SELECTYS® THIOL ROUGE** during alcoholic fermentation adds intensity and aromatic complexity. **The resulting wines have a fresh, fruity "black berry" aromatic profile** (Figure 3).

Yeasting

Thiol Rouge

Saccharomyces cerevisiae selected to enhance the fresh, fruity aromas of red wines.

- Ideal for producing red wines with intense, fresh black fruit aromas
- Ensures safe fermentation with regular kinetics
- Adaptable to the fermentation of all varieties with 'thiol' potential

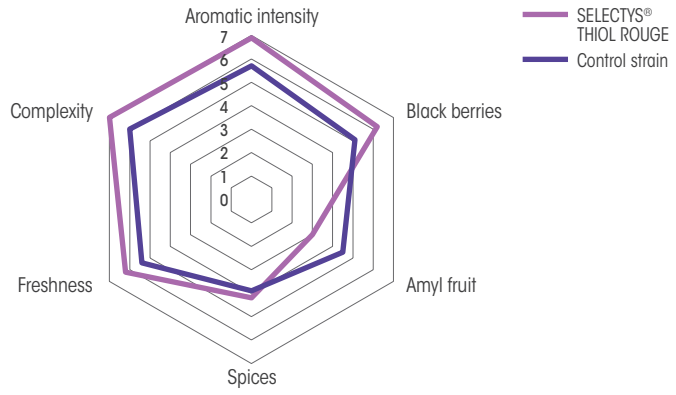

Figure 3. Sensory analysis of wines. Results obtained through a tasting panel of 8 oenologists.

Nutrient choice and timing are also crucial to control fermentation and **optimize the production of 'fresh fruit' esters**. Adding **VIVACTIV® ARÔME** in split doses illustrates this (Figure 9).

Choosing the nutrients

Vivactiv® Arome

100% organic nutrient based on yeast derivatives to provide nutrition that is rich in amino acids.

- Ideal to produce fermentation aromas and reveal varietal aromas
- Enables alcoholic fermentation to take place under the right conditions to produce distinctive, high-quality wines.

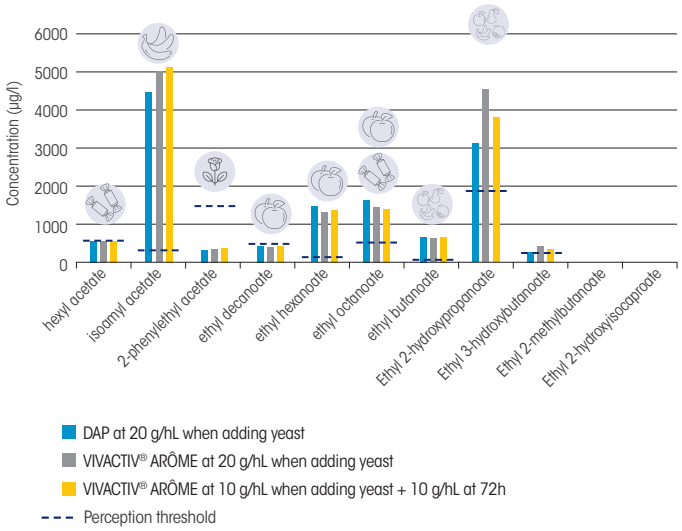

Figure 4. Ester concentrations measured in must using different nutrition modalities.

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PRESERVE ORGANOLEPTIC CHARACTERISTICS

The fining of red wines is an essential lever for adapting the wine's balance to the challenges of climate change. Faced with sometimes heterogeneous phenolic maturity, it enables **the elimination of the most aggressive tannins**. This way, it **reduces the astringency and vegetal notes** associated with berries that are stressed or harvested under severe water stress. By adsorbing certain oxidizable phenolic compounds, it **limits the risk of premature oxidation**, which is particularly critical in warm vintages where dissolved oxygen and color stability are major issues. Ultimately, it **promotes colloidal stability** and the preservation of coloring matter, ensuring a purer, more harmonious expression of the wine despite climatic variations.

Post-MLF fining

OENOVEGAN® EPL

A combination of yeast protein extracts for effective fining that respects the wine.

- Eliminates oxidized and oxidizable polyphenols, including certain tannins responsible for bitterness
- Enhances the fruity aromatic profile and respects the organoleptic characteristics of the wine
- 100% natural alternative to PVPP and animal-based fining agents

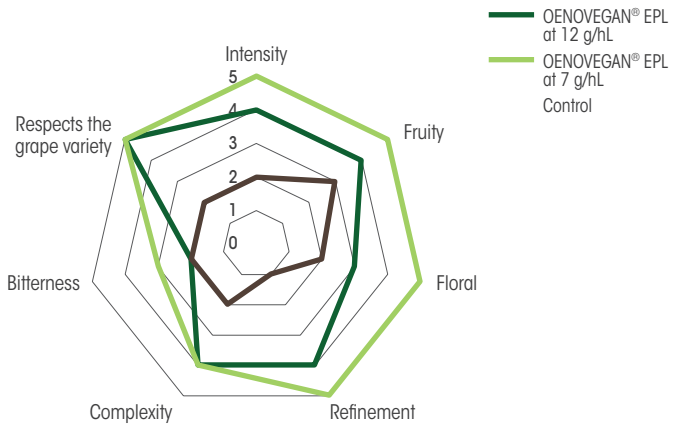

Figure 5. Sensory analysis of wines treated, or not, with **OENOVEGAN® EPL** at 7 or 12 g/hL. Results obtained by a tasting panel of 8 oenologists.

During ageing, tannins are usually added to maintain optimum redox potential and protect the wine's color and aromas, particularly when it was produced using thermovinification.

Choice of tannin

OENOTANNIN PERFECT

Pure grape seed tannin suitable for use at the end of fermentation.

- Stabilizes color definitively
- Strengthens the wine's resistance to oxidation
- Softens the tannic structure

Micro-oxygenation allows red wines to be aged and **provides them with exactly the right amount of oxygen for oxidation** reactions in polyphenols and aromatic compounds (polymerization of tannins and stringency reduction, color stabilization, removal of vegetal notes, etc.).

Aging

OENO 2

Oxygenation system.

- Color stabilization
- Reduction of vegetal notes
- Reduction of tannin astringency and harshness
- Maintenance of redox balance
- Aromatic opening of wines
- Integration of tannins and wood

FRAGILE RED WINES
Dose : 0.5 to 1.5 mg/L/day
Duration: 7 to 15 days → continuous dosage

MODERATELY STRUCTURED RED WINES
Dose : 1 to 2.5 mg/L/day
Duration: 10 to 15 days → continuous dosage

STRUCTURED RED WINES
Dose : 1.5 to 4 mg/L/day
Duration: maximum 20 days → continuous dosage

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