TECH POINT

HOW TO MAKE FRESH WHITE AND ROSÉ 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 WHITE AND ROSÉ WINES: THE VINE

To keep producing fresh white and rosé 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
oenoterrisfleur	Nourishes, rebalances and unblocks to ensure good flowering	Uniform phenolic maturity, optimized aromatic potential
oenoterrisarôme	Better assimilation of nitrogen. Increased synthesis of thiol and ester precursors	Intense, fruity 'thiol' aromatic profile

AFTERWARD

HOW TO MAKE FRESH WHITE AND ROSÉ WINES?

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WHAT ARE THE KEYS TO FRESHNESS IN WHITE AND ROSÉ WINES?

TARGETING THE RIGHT AROMATIC WINDOW

A number of criteria are taken into account when **determining the optimum harvest date**. Based on the measurement of technological maturity indicators (sugars, organic acids, pH) or phenolic maturity indicators (anthocyanins), the 'classic' method is not precise enough to target the right aromatic window. **When the berries' sugar loading stops, this is an extra indicator that can be used to predict the aromatic profile of future wine because it precedes the onset of different aromatic sequences. MaturOx**, a maturuty index from the PolyScan of the WQS range by Vinventions, identifies the moment when sugar loading stops and the aromatic sequence begins. It offers users **several aromatic windows** and makes it possible to select a fresher profile.

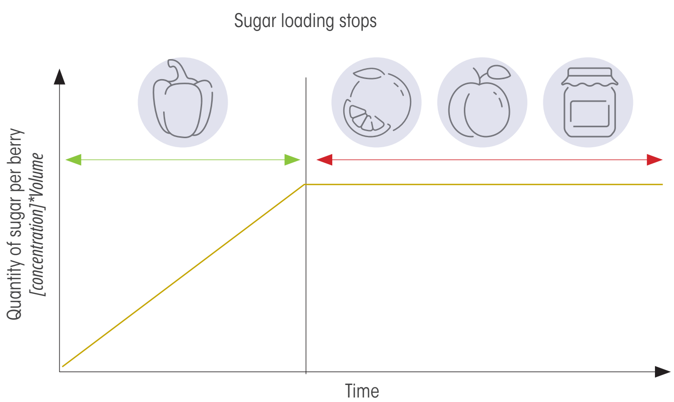

Figure 1: Diagram of berry sugar loading over time and the corresponding aromatic windows.

HOW TO EXTRACT AND PROTECT AROMAS

The mechanical actions performed on grapes during harvest will weaken the pectocellulosic walls of the berry cells, releasing some of the aroma precursors contained in the pulp. **It is important to optimize the extraction of these precursors in order to maximize aromatic potential. To achieve this**, it is advisable to work at low **temperatures and use enzymes when settling** (e.g., pectinases). This will help degrade the walls to speed up the process. **Controlling turbidity and removing coarse lees** with a suitable fining agent enables you to **eliminate bitter polyphenols. Fining also protects aromatic precursors from oxidation** by eliminating oxidized polyphenols (quinones) and easily oxidized polyphenols (phenolic acids) (Figure 2).

Settling

OENOVEGAN® EPL

Synergistic combination of pea protein and yeast protein extracts to optimize fining.

- Reduces oxidized polyphenols and bitterness
- Respects the wine's organoleptic characteristics
- Optimizes settling or clarification

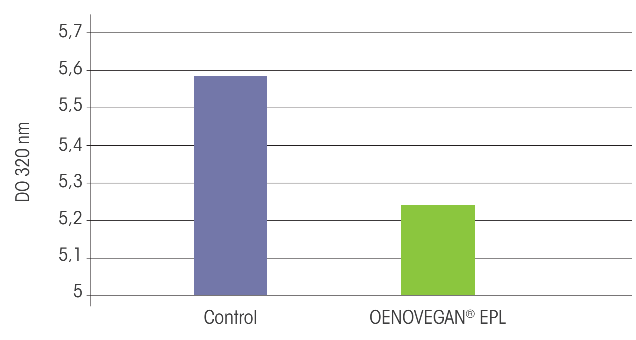

Figure 2. Impact of treatment with OENOVEGAN® EPL on white must. Average OD at 320 nm correlated with oxidation markers.

HOW TO MAKE FRESH WHITE AND ROSÉ WINES?

Cold stabulation for a short period (4 days at around 5 °C) is an additional option that will enhance the extraction of aromatic precursors and preserve them. Turbidity levels should be adjusted according to the targeted aromatic goal.
Using enzymes with specific concentrated activities, for example **SPECTRA® THIOL, boosts the release of varietal aromatic precursors** such as thiols (Figure 3) even at low temperatures like those used in cold stabulation.

Cold stabulation

SPECTRA THIOL

Specific enzyme preparation for the extraction of aromatic precursors from grapes.

- Promotes the release of primary grape aromas like those from thiols
- Completes aromatic gain in cold stabulation
- Facilitates clarification and the natural sedimentation of must

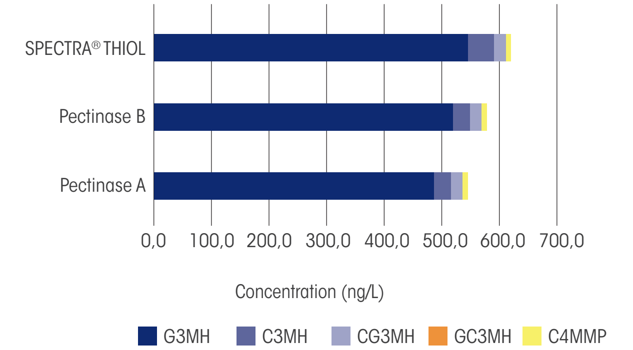

Figure 3. Thiol precursor concentrations measured in white must after cold stabulation and treated/untreated with SPECTRA® THIOL.

Afterward it is essential to protect them from oxidation. **Targeting heavy metals such as copper** with PVP/PVI-based solutions like **DIWINE® THIOL** helps prevent these reactions by chelating them. Copper is an essential element for polyphenol oxidase (PPO) to transform phenolic acids into quinones. These can lead to aromatic losses even in the presence of low copper concentrations and in the long term, sometimes several months after bottling. **Early elimination of copper thus enables you to preserve the longevity of aromas** (Figure 4).

DIWINE® Thiol

Specific PVP/PVI-based formulation for the preservation of volatile thiols in must containing heavy metals.

- Protects the must and its aromas from oxidation and prevents premature aging by means of the reducing compounds it releases
- Adsorbs easily oxidizable polyphenols (phenolic acids)
- Reacts with quinones to prevent them from complexing with polyphenols and volatile thiols, and from precipitating

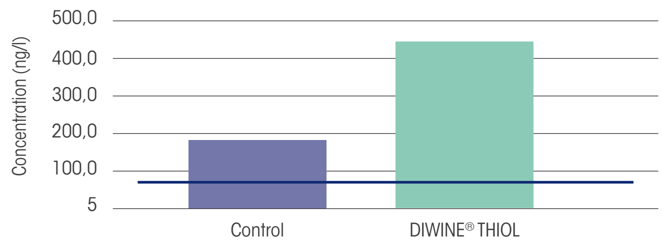

Figure 4. 3-mercaptohexan-1-ol (3MH) concentrations measured during alcoholic fermentation in white must, treated/untreated with DIWINE® THIOL.

HOW TO MAKE FRESH WHITE AND ROSÉ WINES?

HOW TO MANAGE MUST ACIDITY

One way climate change impacts vines is lower malic acid levels. This translates into microbiological fragility and lower total acidity. Some non-*Saccharomyces* yeast strains such as **NEVEA™, a *Lachancea thermotolerans* strain**, are highly effective for rebalancing wine acidity by producing lactic acid, when used in sequential fermentation with a *Saccharomyces cerevisiae* yeast strain (Figure 5).

Managing acidity

NEVEA™ *Lachancea thermotolerans*

Pure *Lachancea thermotolerans* culture selected for its ability to produce controlled levels of lactic acid from the moment it is inoculated.

- Suitable for low temperatures and low must turbidity
- Increases wine's total acidity by producing large quantities of lactic acid

Lachancea thermotolerans is able to metabolize fermentable sugars into lactic acid. In addition, this metabolic feature leads to the production of glycerol and a specific aromatic compound (HPE2: ethyl 2-hydroxypropanoate)

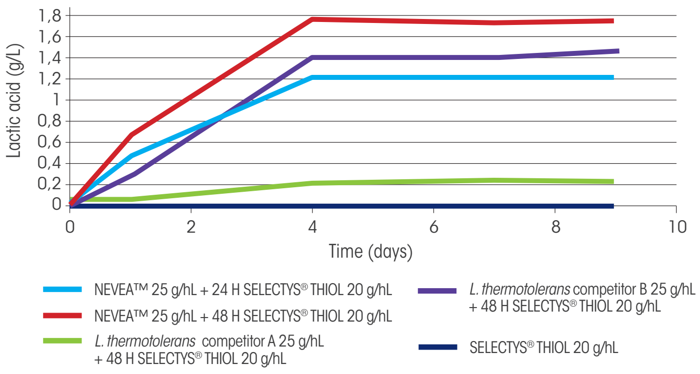

Figure 5. Monitoring of lactic acid accumulation from day 1 to day 4 of alcoholic fermentation. This correlates with the increase in total acidity over the same period. At this stage of fermentation alcohol content is 4.7 to 6.3% vol.

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 6).

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

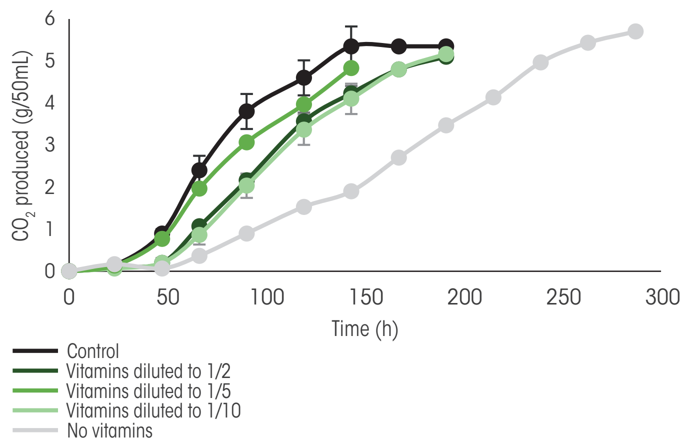

Figure 6. Monitoring of the fermentation kinetics of a selected strain of *Saccharomyces cerevisiae* yeast inoculated at 20 g/hL in the presence or absence of more or less diluted vitamin pool. Results subjected to statistical analysis (Kruskal-Wallis; $p<0.05$).

MAXIMIZING THIOL POTENTIAL

The choice of yeast strain is decisive in **revealing and maximizing accumulated aromatic potential**. The release of volatile thiols in wines is made possible by the production of endogenous enzymatic activity by *Saccharomyces cerevisiae*: **ß-lyase**. ß-lyase **enables the cleavage of odorless cysteinyl precursors**. This ability is linked to a genetic feature of certain strains in the ***IRC7* gene**. This gene is responsible for ß-lyase production if it has 2 long alleles. Some strains like **SELECTYS® THIOL** have 2 long alleles in the *IRC7* gene and this heightens their ability to **release volatile thiols during AF** (Figure 6).

Reasoned organic nutrition (10+10 to 20+20) is also important to ensure the assimilation of thiol precursor while limiting catabolite repression phenomena of the NCR (Nitrogen Catabolite Repression) system that regulates nitrogen assimilation in yeast.

Yeasting

Thiol

Saccharomyces cerevisiae specifically selected for its enhanced capacity to reveal thiols.

- Adds intense, elegant thiol aromas (4MMP, 3MH, 3MHA).
- Produces low quantities of SO_2 and helps reduce sulfites in wines.
- Ideal for modern white and rosé wines

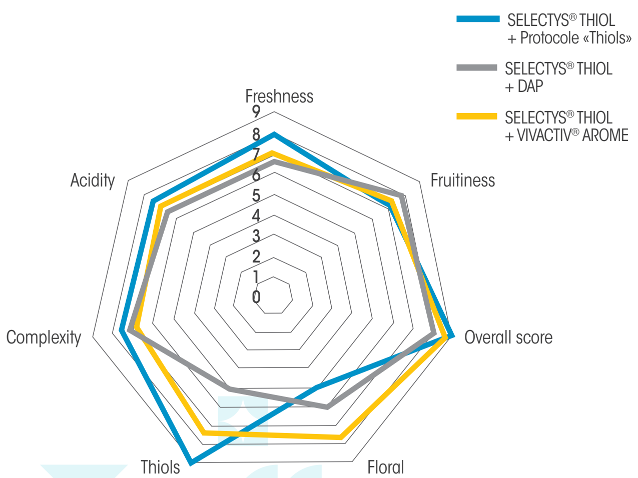

Figure 7. Aromatic profiles obtained for Sauvignon blanc wines following different modalities: a complete 'thiols' itinerary, alcoholic fermentation with organic nutrition and alcoholic fermentation with mineral nutrition.