HOW TO MAKE FRESH, EASY-TO-DRINK WINES

WINE IS ALSO IMPACTED BY GLOBAL WARMING

The impact of global warming on vines has been studied for decades in multiple wine regions worldwide. It is now clear that global warming 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.

Global warming, 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.**

Concomitant with 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 go on making fresh white and rosé wines or supple, generous reds, **oenological goals must be defined right from the start – at the vineyard**, where we can find the first levers to combat the consequences of global warming. 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
	oenoterris fleur	Nourishes, rebalances and unblocks to ensure good flowering	Uniform phenolic maturity, optimized aromatic potential
AFTERWARD			
	oenoterris arôme	Better assimilation of nitrogen. Increased synthesis of thiol and ester precursors	Intense, fruity 'thiol' aromatic profile
OR			
	oenoterris expression	Better berry growth and polyphenol synthesis	Enhanced color and structure potential and higher ester concentrations

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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 specific NOMASense™ PolyScan (WQS by Vinventions) index, 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.

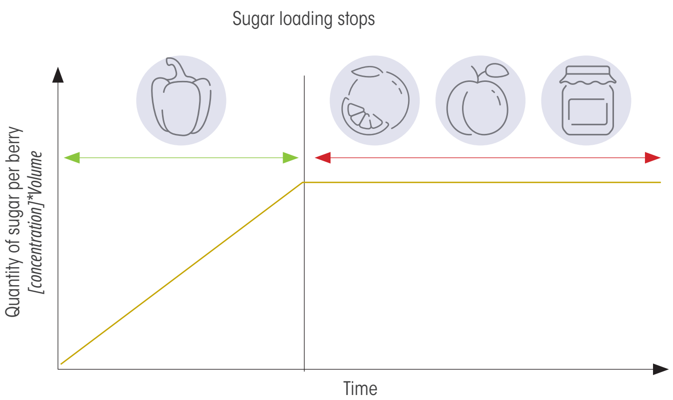

Figure 1: Diagram of berry sugar loading over time and the corresponding aromatic windows.

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

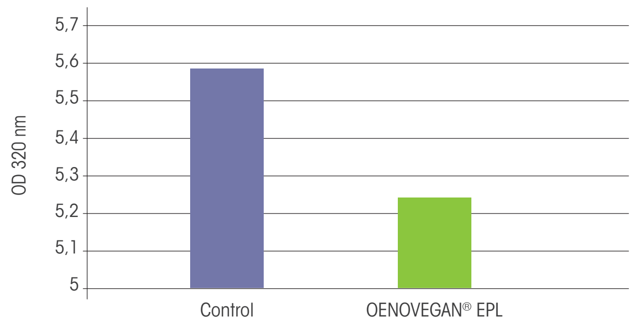

Figure 2. Impact of treatment with OENOVEGAN® EPL on white must. Average OD at 320 nm correlated with oxidation markers.

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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

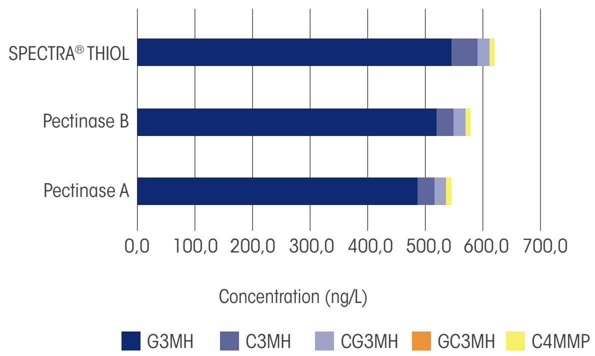

Figure 3. Thiol precursor concentrations measured in white must after cold stabulation and treated/untreated with SPECTRA® THIOL.

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

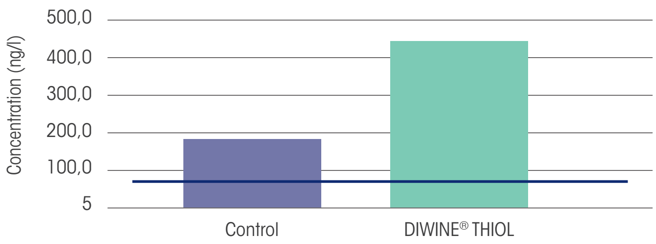

Figure 4. 3-mercaptohexan-1-ol (3MH) concentrations measured during alcoholic fermentation in white must, treated/untreated with DIWINE® THIOL.

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HOW TO MANAGE MUST ACIDITY

One way global warming 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)

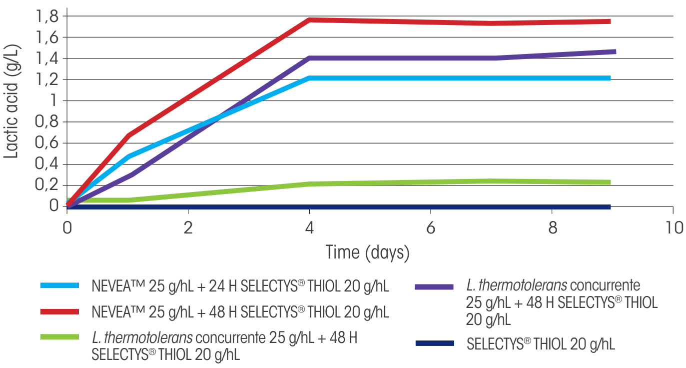

Figure 5. Monitoring of lactic acid accumulation from day 1 to day 4 of alcoholic fermentation. This correlates with the increase in total acidity over the same period. At this stage of fermentation alcohol content is 4.7 to 6.3% vol.

HOW TO REVEAL THIOLS

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

programme SELECTYS® LEVURES - YEASTS *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

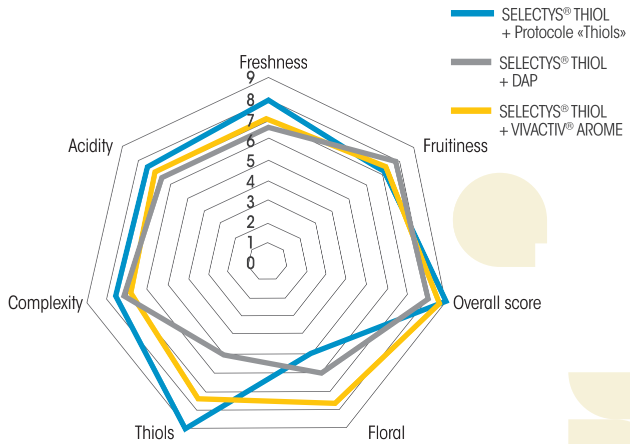

Figure 6. Aromatic profiles obtained for Sauvignon blanc wines following different modalities: a complete 'thiols' itinerary, alcoholic fermentation with organic nutrition and alcoholic fermentation with mineral nutrition.

HOW TO MAKE FRESH, EASY-TO-DRINK WINES

WHAT ARE THE KEYS TO THE DRINKABILITY OF RED WINES?

HOW TO ACHIEVE MICROBIOLOGICAL BALANCE

Higher must pH is a consequence of global warming 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 7).

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

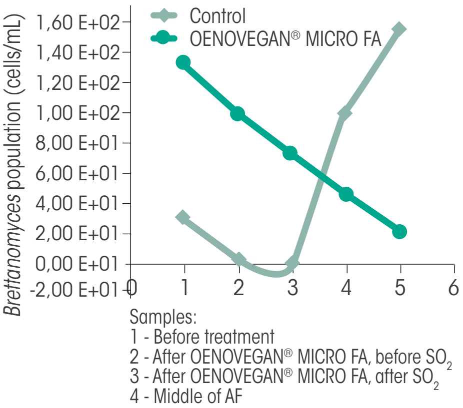

Figure 7. *Brettanomyces bruxellensis* population growth during vinification of red must (Merlot). Analysis by qPCR. Control is sulfited.

HOW TO REVEAL AROMAS

As with white and rosé wines, the choice of yeast strain used to **develop aromas must be based on the targeted aromatic goal and the characteristics of the must.** For instance, **SELECTYS® ITALICA CR1** helps produce aromatic red wines and simultaneously counteract high alcohol content, which is becoming increasingly common (Figure 8).

Choosing the yeast

programme SELECTYS® LEVURES - YEASTS

Italica CR1

Saccharomyces cerevisiae selected to make red wines with high alcohol potential (> 18% vol.).

- Fresh, fruity aromatic profile
- Excellent fermentation kinetics
- High glycerol production ensures roundness in the mouth

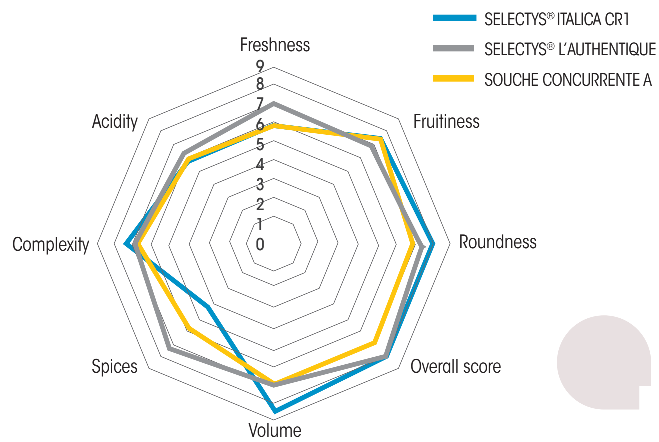

Figure 8. Aromatic profiles obtained for Merlot wines vinified with different yeast strains at 20 g/hL.

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.

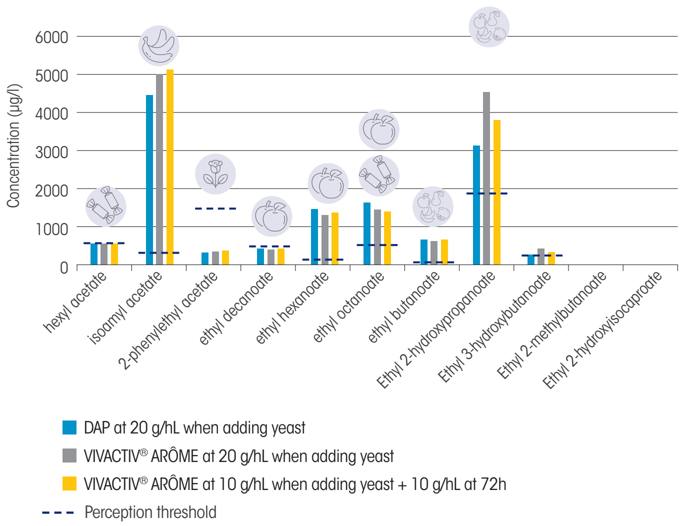

Figure 9. Ester concentrations measured in must using different nutrition modalities.