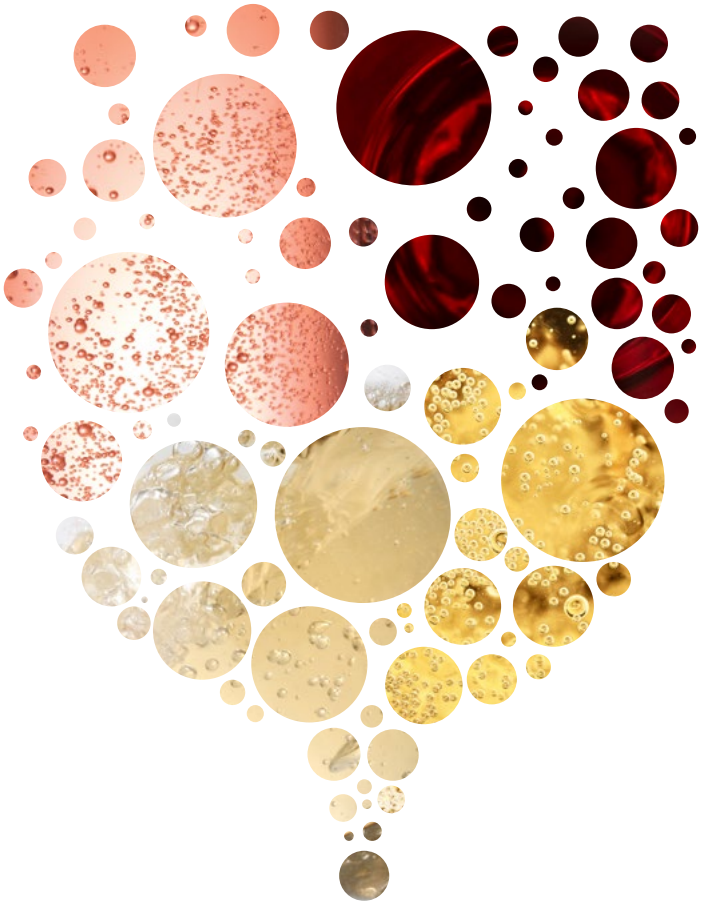
Anchor
OENOLOGY
Supporting you from grape to glass



THE ANCHOR OENOLOGY WINEMAKER'S GUIDE

FOR THE PRODUCTION OF WHITE, ROSÉ, RED AND SPARKLING WINES

2020

THE **ANCHOR OENOLOGY** WINEMAKER'S **GUIDE**

evolution
/ˌiːvəˈluːʃ(ə)n,ˈɛvəluːʃ(ə)n/

noun

definition: the process of growth and development

synonyms: development, advancement, growth, rise, progress, progression, expansion, extension, unfolding; change, metamorphosis; transformation, adaptation, modification, revision, reworking, reconstruction, recasting

In stark contrast, the antonyms for evolution include words like stasis, inactivity and changelessness. All words that threaten the survival and success of any company or brand. It is for this exact reason that we have decided to focus on the theme of EVOLUTION for our latest issue of the Anchor Guide.

Evolution can take place via:

- adaption, a process by which we become better suited to our environment. This relies on the gradual modification of existing structures. Anchor Biotechnology, as a division of the mother company Anchor Yeast, has evolved to Anchor Oenology, now being home to not just yeast, but a range of products including non-biologicals and products for sparkling wine production.

- co-evolution, whereby the interactions between ourselves and other role-players can produce both conflict or cooperation. In the 1990's, Anchor brought to the market the first ever hybrid wine yeast strain, VIN 13, which forced our competitors to follow suit and evolve by producing their very own hybrid strains.

- cooperation is based on the many cases of mutually beneficial interactions that have evolved. New wine styles that emerge in the industry allow all role-players to explore new technologies and new markets. The rise in the popularity of Rosé wine consumption and concomitantly production, has opened many new product avenues.

- and finally extinction, not an unusual event that usually happens due to one species being able to out-compete another. This means that products that were not responding to the needs of the wine industry, have been removed along the way.

Changes evident in the worldwide wine industry:

- Wineries are adapting to different consumers with different values: customers who now use the internet in increasingly interactive ways, as well as customers who are more frugal and have access to less discretionary income than previous generations.

- Whilst Millennials (age 22-38) and Gen Xers (age 39-50) now consume liquor and beer more frequently than wine, they still increase their wine purchases each year. It is predicted that Millennials (already surpassing the Baby Boomers) will surpass Gen Xers to become the 'largest fine wine consuming generation' by the year 2026. Millennials are unique in the sense that they display limited category loyalty (evident in their purchases of beer, liquor and wine); they are showing limited interest in the lowest-price wine segment, but at the same time they are looking for high quality at an acceptable price. This group thrives on new experiences and will easily explore new varietals when making purchase decisions. The current 'new and exciting' experience is that of Rosé wine, the impact clearly evident in the global surge in this wine category.

- There is a surging demand for sparkling wines.

- Developing countries are increasing their wine consumption, specifically Asia-Pacific, dominated by China. This is followed by Australia and Japan. Displaying the fastest wine consumption growth rate is India. Other potential markets include the Philippines, South Korea and Vietnam. An expanding middle-class is a major driver for future wine growth prospects in Brazil and Argentina.

- The premium market segment is displaying the most growth.

- Consumers (in a trend mainly led by Millennials) are choosing to 'drink in': rather than paying premium mark-ups on wine in restaurants, off-premise consumption is increasing. This is key when targeting marketing campaigns to this segment.

- The increasing consumption of wine at home and private social settings, have resulted in new forms of packaging focusing on convenience and portability. These include canned wines (hugely popular in New Zealand due to their popular outdoor music festivals and concerts).

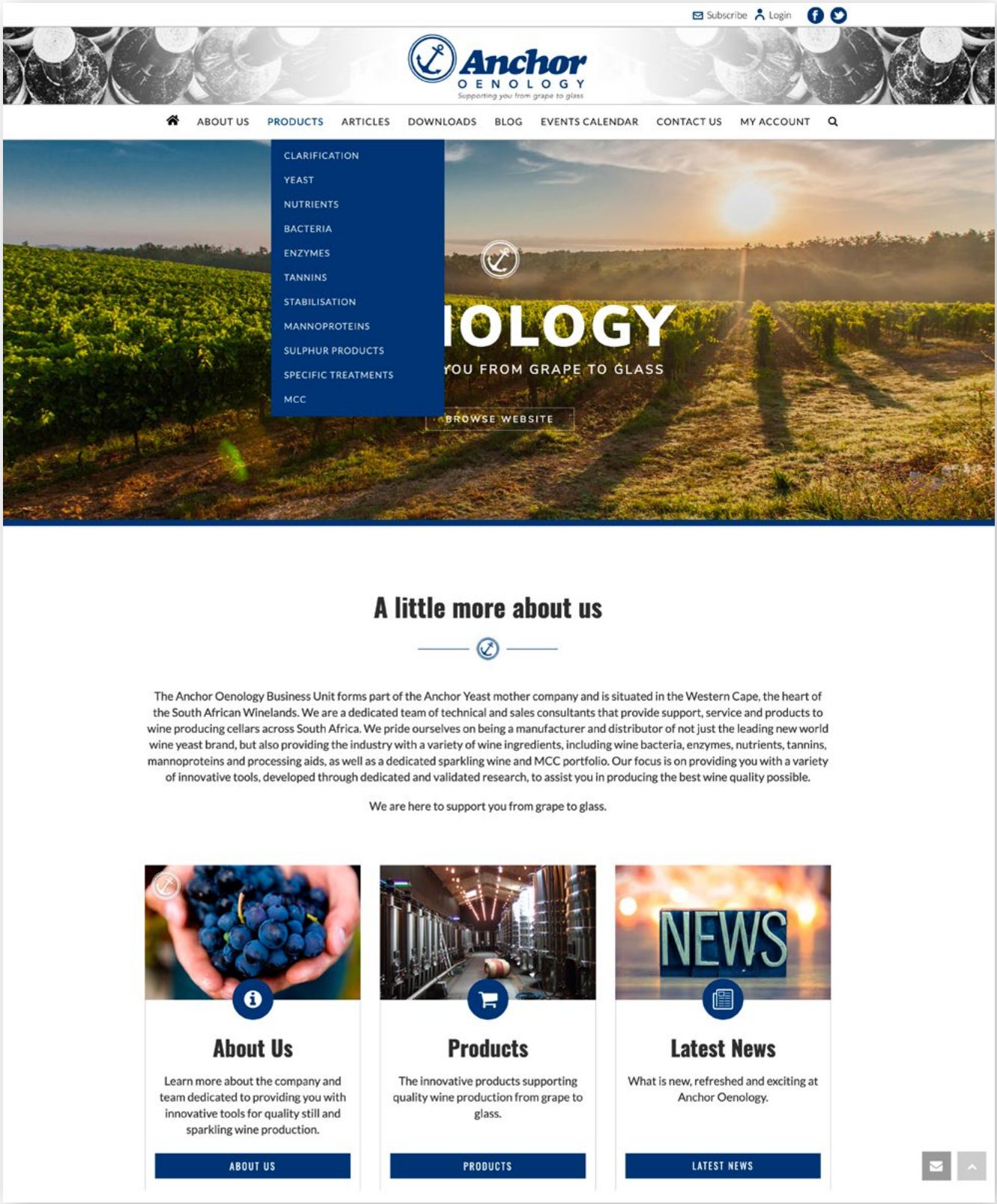
- Climate change and global warming are causing gradual shifts in the wine grape regions (as we know it); the grape varieties that are being cultivated (more drought resistant etc.); causing changes in the grape chemistry and resultant wine quality; rising sea levels could lead to losses in vineyards; increased insects and disease pressure, as well as changes in quality of the oak. Changes in the grape chemistry could potentially include: elevated sugars, lower acid concentrations and lower anthocyanin and methoxypyrazine levels. According to NASA, the global average surface temperature rose 0.6 to 0.9°C between 1906 and 2005, and the rate has nearly doubled in the last 50 years.

Of course evolution implies change and at Anchor Oenology, we embrace these changes.

In an evermore digital landscape, we realise that convenience is not just important when you do your everyday shopping, but also when it comes to securing the best products for producing your wine. It is for this very reason that we are proud to be one of the first wine industry suppliers to offer a complete online ordering system on our brand new website. Even better, this brand new website is 100% mobile compatible, so you have the convenience of accessing your account and placing an order on your mobile phone or tablet.

Please visit **www.anchoroenology.com** for an evolutionary experience!

Customers visiting from anywhere in the world have access to all the latest information on the Anchor team and the product portfolio we provide. All the technical product information, as well as supporting quality control documentation, is now a click away.



Last year's edition of the Anchor Book showcased the brand new packaging design, which you would have experienced first-hand during the 2019 vintage. Of course, we won't stop there! During the course of the 2020 and 2021 vintages, you will be experiencing the brand new corrugates, professionally designed to not just match the beautiful aesthetics of the new packaging, but to bring you stronger, more durable and more easily identifiable boxes in which our quality yeast strains will be delivered to you.

The major changes include:

- moving from brown boxes to easily identifiable boxes that indicate the range of yeast strain as Exotics, Alchemy or Legacy
- a new packing configuration which allows for more effective and timesaving quality control checks (the packs will be standing upright)
- moving from a single flute to double flute construction for the cardboard means a stronger, more durable box, that can handle the cold transport more effectively
- a new Z-fin included inside the box enforces the structural integrity of the box, especially for palletisation

And we are not done yet! Watch this space for more evolutionary changes coming your way!

GETTING TO KNOW THE ANCHOR TEAM

With the 2020 edition of the book, we would like to ask the team how their careers in the wine industry have undergone some evolutionary changes and some future changes they are looking forward to...

Director of Anchor Oenology: Danie Malherbe
dmalherbe@anchor.co.za | 060 660 6360

Evolution is usually a slow, but mighty process that happens over time. My career started in research as a scientist and evolved over time, first gaining knowledge and a technical understanding of wine processing aids. This was followed by assisting winemakers in their choice of what to use to improve their wine quality, to where I am currently, business management. When I look back at the past two years I have spent in Anchor Oenology, we have evolved on so many different levels - the brand's look and feel, the products we offer to our clients and the people who work here. I am proud to be part of this growth and the talented team I have the privilege to work with every day. Bring on the future, as we will not be stuck in the past!

Technical Sales Manager: Mmule Masalesa
mmasalesa@anchor.co.za | 082 882 3539

Our theme is EVOLUTION! Honestly what on earth is that? Looking back at when I joined the wine industry many years ago and now, I have definitely evolved as a human being for the better: a mother to beautiful children, learned several languages and most importantly, the friendships I developed with awesome people within the wine industry. I am looking forward to spending time with my amazing family and I hope to be able to run 10km in less than 60 minutes!

Technical Sales Manager: Julie de Klerk
jdeklerk@anchor.co.za | 082 943 0651

Coming from Champagne in France, it was a natural evolution for me to end up in the MCC industry. I now get to make a contribution either directly, as a member of the MCC association, or indirectly by supplying products and services for this luxurious wine. My goal is to work closely with the producers to help make Cap Classique a prestigious, world-famous brand.

Office Administrator and Personal Assistant: Elicia Wethmar
ewethmar@anchor.co.za | 021 534 1351

I started out in the motoring industry and moved to wine almost six years ago. It took some time, but today I know so much more about the products and processes. My day-to-day looks different now, a change from making out delivery notes to being hands on with the finances, arranging events and interacting with customers. I hope to grow in my understanding of the products and processed that are part of making wine and to see more of our customers at all of our events.

International Product Manager: Elda Lerm
elerm@anchor.co.za | 082 903 0694

Evolution to me means changing and adapting, but also keeping hold of the good parts, the parts that make you, you! After graduation, it just felt natural to combine my passion for wine, with my passion for science and research. This of course lead me to the lab and where my love for my bacteria bugs started. Now, many years later, I have managed to combine my very science and research driven left brain, with my creative branding and marketing right brain. Who says you can't have the best of both worlds?

Product Planning and Quality Assurance Manager:
Farieda Safudien | fsafudien@anchor.co.za | 021 534 1351

Anchor Yeast has gone through many changes over the years, and so has my career. I started out as a Lab Technician, many moons ago, moved to QC and finally QA. In 2009, I assumed a role in Logistics, a different challenge, but a fantastic learning curve. Now I am back where I belong and doing what I love most, making quality a priority. And of course, making sure we have quality products on time for our customers. Whilst 2019 has been a challenging year, I have realised that time and health are two of the most valuable assets we have, so despite all the challenges that lies ahead and all the possible pot holes in the road in 2020, "ME TIME" will be my new buzz word.

Technical Sales Manager: Lauren Behrens
lbehrens@anchor.co.za | 082 426 1369

At the beginning of my career I inherited knowledge from generations before me (University) to understand wine and how to make it. During the course of my winemaking career, many things evolved: new equipment, techniques and styles of making wine. I then decided to experience life on the other side of the supply chain: supporting winemakers with new innovations from Anchor. Of course going forward, I believe that together with the wine industry we can reproduce more knowledge and share it with the future generation. Things change and the only way to survive is to stay one step ahead!

Orders and Deliveries: Sebastian Petersen
spetersen@anchor.co.za | 021 534 1351

ORDERS, DELIVERIES AND TECHNICAL SUPPORT

Place your order online at www.anchoroenology.com.

Alternatively, send your order to Sebastian, Elicia or your Technical Sales Manager.

Share/send your order form (including your order number and preferred delivery date) via:

Telephone: 021 534 1351 or Email: oenology@anchor.co.za

WHEN DOES IT GET DELIVERED?

- Tuesdays
- Thursdays
- Every second Friday
- Daily: Other major areas
- Twice per season

EMERGENCY DELIVERIES:

Speak to the Technical Sales Manager in your area.

CONSULTANT / AREAS

Contact the Office	Mmule Masalesa	Lauren Behrens	Julie de Klerk
Midlands	Orange River	Olifants River	IOC Product Range
Southern Cape	Worcester	Stellenbosch	Method Cap Classique enquiries
Overberg	Algoa	Garden Route	and support
Durbanville	Klein Karoo	Franschhoek	
Paarl	Breedekloof	Helderberg	
Swartland	Robertson		
Johannesburg	Tulbagh		

ACCOUNT DETAILS

Name	RYMCO (PTY) LTD T/A ANCHOR YEAST
Bank	Nedbank
Branch	Industria
Branch code	198765
Account type	Current
Account number	196-328-3910
Reference (account holders)	Account number starting with SA
Reference (COD customers)	Invoice number (delivery after proof of payment)
Payment terms (account holders)	30 days from account statement

THE FINE PRINT

- Open an account before the harvest season to allow adequate time for a credit check.
- No unused product will be taken back after the season.
- Products have adequate shelf-life if stored correctly.
- For all certification and documentation, contact your Technical Sales Manager.

ANCHOR S.O.S TRUCK FOR EMERGENCY DELIVERIES

We want to make it possible for you to get the product you need… when you need it most!

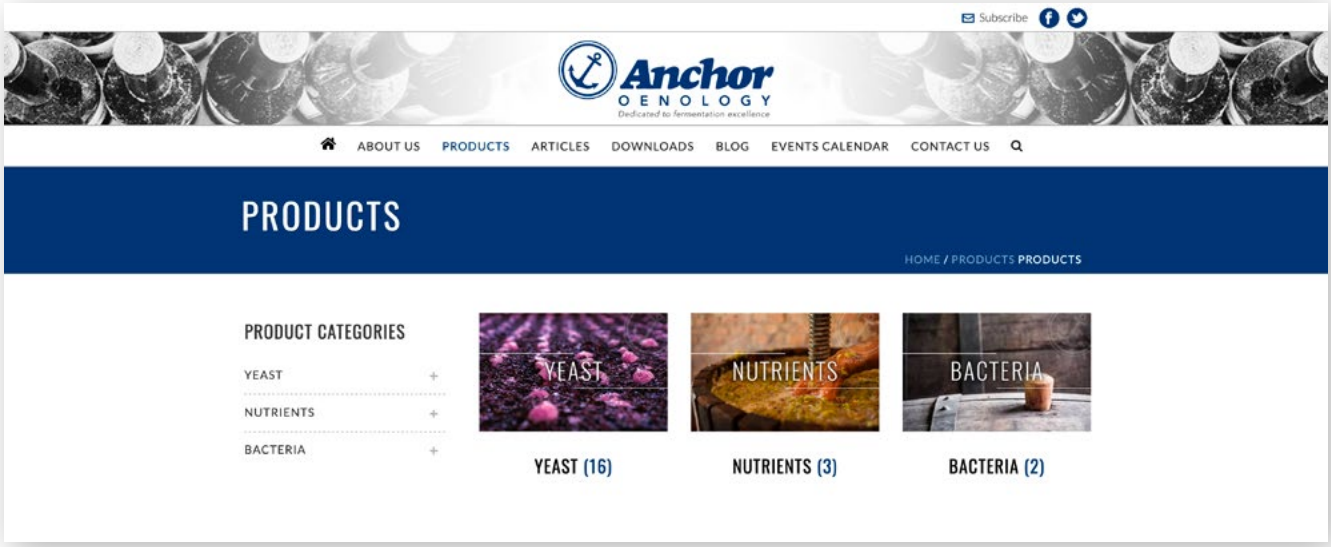
A special truck will be armed with all your favourite Anchor products, driven by the man with the smile, Patrick Khumalo.

WE ARE BRINGING PRODUCTS RIGHT TO YOUR DOORSTEP! WE ARE HERE FOR YOU!

Normal terms and conditions apply for all account holders, otherwise COD.

Patrick Khumalo:
079 541 0319

PLACE YOUR ORDER ONLINE!



In an industry first, winemakers can now place their orders online by visiting

www.anchoroenology.com

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CHAPTER 1: CLARIFICATION

INTRODUCTION

Clarification is the process (natural or induced), whereby 'undesirable', insoluble, suspended particles are removed from the juice and/or wine and the liquid becomes 'clear'. These insoluble, suspended particles may include pectins, proteins, tannins, other phenolic compounds, pieces of grape skin, pulp and stem, as well as yeast, bacteria and tartrates. Fermentation in the presence of these solids usually leads to decreased varietal aromas, a bitter taste and a higher concentration of reductive odours. In contrast, clarified must tends to deliver fresher, fruitier aromas and a lower concentration of higher alcohols.

Must for the production of white and rosé wines, as well as must from the thermovinification of red grapes, are usually clarified before fermentation. The two main clarification techniques are based on 1) sedimentation and 2) flotation. Both of these processes require the use of pectinolytic enzymes to hydrolyse the pectins originating from the grape cell walls and released during pressing.

These negatively charged pectins surround the positively charged proteins and the negative outer layers then repel each other. This creates solid haze formation. Pectinase enzymes expose the 'inner' positive charge of the proteins and the particles of opposite charge can then agglomerate and settle. Clarification agents increase these electrostatic interactions. The pectin content is dependent on the ripeness level, vintage, cultivar (Muscat) and sanitary state (*Botrytis* infection).

Clarification via sedimentation/cold settling:

- Reliant on gravity.
- Energy-intensive and labour intensive process.
- Require cooling and the use of commercial enzyme preparations.
- Requires little special equipment.
- There is a practical limit to the efficiency, as particles smaller than 1 µm sediment very slowly, if at all (reduced risk of over-clarification).
- Time-consuming.
- Rate of the settling is dependent on the temperature, viscosity and colloidal content (particle size and density).
- Intense cleaning required (tartrate build up) and a loss of total acidity.
- Higher lees percentage and percentage of volume loss.

Clarification via flotation:

- Requires the addition of fine gas bubbles from the bottom of the tank. These bubbles adhere to the insoluble particles and form complexes that have a lower density than the surrounding liquid. As a result, these complexes float upwards and collect as a foam blanket at the top. The clear liquid can then be racked from the bottom.
- Requires specialised apparatus: flotation unit, pressurisation pump, gas supply and dosage pump.
- Requires the use of enzymes and flotation aids.
- Flotation gasses include nitrogen (most popular), carbon dioxide, oxygen, argon and air. A pressure of 5-7 bars allow the bubbles to move at a speed slow enough to adhere to particles and not create unnecessary foam.
- Cost effective, fast and efficient.
- Can be done right after pressing.
- Low energy consumption/cost.
- Faster production flow (saving tank space).
- Ability to use in continuous or batch mode.
- Higher juice yield, less lees and less oxidised juice.
- No loss of tartaric acid.

Fining agents clarify wine, control browning due to oxygen and improve the overall wine stability. Traditional fining agents include mineral substances (bentonite, silica), animal-derived agents (casein, egg white, gelatin and isinglass), polysaccharides (chitin, chitosan), alginates and polyphenols (tannins).

Alternative fining agents:

Due to the demand from consumers, winemakers are continually looking for alternatives to animal-derived and allergenic products in the winemaking process.

Alternatives now include pea proteins, as well as products focusing on fungal-derived chitin *(Aspergillus niger)*, as well as chitin by-products like chitosan and chitin-glucan. These products can now be used as alternatives for casein and gelatin during the fining and clarification processes, including their use as flotation adjuvants.

Chitin is the second most naturally present polysaccharide, after cellulose. It is structurally identical to cellulose (the compound that provides structural support to plant tissues), but has acetamide groups (-$NHCOCH_3$) at the C_2 positions. Chitin is a primary component in the exoskeletons of arthropods and crustaceans and is also found in the cell walls of some species of fungi. The latter is important, as chitosan, the principle derivative of chitin via de-acetylation, is a natural polysaccharide extracted from a fungal source of chitin, namely *Aspergillus niger*. Chitin and chitosan are renewable polymers that have excellent properties of biodegradability, bio-compatibility, non-toxicity and adsorption. These characteristics make them ideal alternatives to animal-derived fining agents and approved for use in organic and vegan wine production.

Chitin derivatives from fungal origin have been allowed in winemaking according to EU Regulation and have various potential uses in the winemaking process:

- Stabilisation
- Clarification
- De-acidification
- Removal of heavy metals
- Elimination of Ochratoxin A, enzymes and pesticides
- Natural microbiological control
- Reduced sulphite usage
- Anti-oxidative activity

Similarly, alternatives to casein like pea proteins and PVPP, can have an impact on phenolic compounds, colour, browning potential and the sensory attributes of the wine.

Various products exist in aiding with the process of clarification, be it via sedimentation or flotation. The selection of the clarification method should be influenced by the practical parameters due to the cellar setup, as well as the desired juice quality. In addition, the selection of clarification aids can now also be influenced by consumers and their need for wines produced with products free from animal-derived origins.

PRODUCT SELECTION

	Colorprotect V	Freshprotect	Qi-Fine	Clarifiant XL	Clarifiant BK
Composition	**bentonite, PVPP, vegetable proteins**	**PVPP, bentonite, cellulose, arabic gum**	**a blend of chitosan and pea protein**	**bentonite**	**hydrated aluminium silicate**
Clarification via sedimentation	■	■	■	■	■
Clarification via flotation					
Sparkling wine				■	■
Juice	■	■	■		
White and rosé wine	■	■	■		
Red wine					
Reduce oxidation	■	■	■		
Treat oxidation					
Remove brown colour	■	■			
Remove pinking	■				
Reduce bitter and/or herbaceous notes		■	■		
Reduce astringency			■		
Remove protein fractions			■		
Remove polyphenolic compounds			■		

	Inofine V	Qi-UP XC	Bent-Up	Qi No[Ox]
Composition	**pea proteins combined with mineral-derived additives**	**fungal-derived chitin derivative**	**bentonite**	**polysaccharides and bentonite**
Clarification via sedimentation				■
Clarification via flotation	■	■	■	
Sparkling wine				
Juice	■	■	■	■
White and rosé wine			■	■
Red wine			■	
Reduce oxidation				■
Treat oxidation				■
Remove brown colour				■
Remove pinking				
Reduce bitter and/or herbaceous notes				■
Reduce astringency				
Remove protein fractions			■	
Remove polyphenolic compounds			■	■

PRODUCT CATALOGUE

Suitable for production of low SO_2 wines V Suitable for vegan wine production

COLORPROTECT V

A blend of bentonite, PVPP and vegetable proteins that has been developed to be used on must and wine for preventing wine oxidation and pinking.

REDUCE OXIDATION EFFECTS

APPLICATION:
- Protecting musts that are sensitive to oxidation.
- Prevents atypical ageing in white wines.
- Reduces brown colouring in oxidised wines.
- Significant reduction of pinking phenomena.

USAGE: Mix Colorprotect V in 10 times its weight in cold water while stirring. Leave for three hours, mix and incorporate into the must or wine.

DOSAGE: 25 - 80 g/hL (must) / 20 - 50 g/hL (white and rosé wine)

SKU: 1 KG

FRESHPROTECT

This is a blend of PVPP, bentonite, cellulose and Arabic gum developed to remove the brown colour responsible for the visual oxidative defect in white wines.

TREATMENT OF OXIDISED WINES

APPLICATION:
- Musts that show sensitivity to oxidation.
- Removes the brown colour in oxidised white wines.
- PVPP combined with cellulose significantly decreases bitter and herbaceous notes.

USAGE: Mix Freshprotect in 10 times its weight in cold water while stirring. Leave for one hour, mix and incorporate into the must or wine with a fining agent.

DOSAGE: 20 - 100 g/hL (must, white and rosé wine)

SKU: 1 KG

QI FINE

A natural, biodegradable, non-allergenic product free from products of animal origin for fining must and wine. Qi Fine is a blend of chitosan (a chitin derivative with a high charge density for speedy flocculation and sedimentation) and pea protein, specifically selected for its strong reactivity to phenolic compounds.

REMOVE OXIDISED COMPOUNDS

APPLICATION:
- Adsorb oxidised phenolic compounds.
- Correct bitterness and astringency defects.

USAGE: Dissolve Qi Fine in 5 to 10 times its weight in water to obtain a uniform suspension. The prepared solution can be introduced to the must prior to or during fermentation, or directly in the wine. Rack off after complete sedimentation of the lees. Qi Fine is also compatible with flotation.

DOSAGE: 10 - 30 g/hL (white and rosé free-run must) / 20 - 50 g/hL (white and rosé press juice) / 10 - 30 g/hL (wine)

SKU: 1 KG

CLARIFIANT XL

This is a riddling additive offering excellent fining properties. This product gives a high degree of clarification and sedimentation, which is particularly effective for difficult riddling operations.

CLARIFICATION DURING RIDDLING

APPLICATION:
- Sparkling wines.
- A high degree of clarification and sedimentation during riddling.
- Suitable for manual and automated riddling.

USAGE: Incorporate Clarifiant XL just before racking, after having added and thoroughly blended the liqueur and the yeast. Stir continuously throughout the bottling process.

DOSAGE: 60 - 80 ml/hL (sparkling white wines) / 80 - 100 ml/hL (sparkling red or rosé wines)

SKU: 1 L / 5 L / 10 L

CLARIFIANT BK

This product helps to create compact sedimentation in the bottle and assist its movement down the bottle during riddling. It has a gentle mode of action producing brilliantly clear wines.

CLARIFICATION DURING RIDDLING

APPLICATION:
- Create compact sedimentation during riddling.

USAGE: Dissolve 600 g of powder in small amounts at a time in cold water and mix vigorously for one hour. Leave to swell for 6 to 12 hours mixing occasionally. Add the mixture to the wine immediately before bottling and ensure the resultant mixture is continually homogenised.

DOSAGE: 80 ml/hL of the prepared solution

SKU: 1 KG

INOFINE V

Inofine V is a formula made up exclusively from pea proteins combined with mineral-derived additives, particularly used for applications involving must clarification and wine fining.

SEDIMENTATION

APPLICATION:
- Vegan wines.
- Alternative to gelatin.
- Coupled with a fining agent, it provides efficient sedimentation of suspended matter.

USAGE: Disperse Inofine V in 10 times the amount of water to obtain a homogenous suspension, which is stored for the duration of the treatment. The mixture is slowly and homogenously incorporated into the total must or wine volume. It is strongly recommended to add a fining agent before using Inofine V. It is safe to add enzymes to the must before treatment.

DOSAGE: 10 - 30 g/hL

SKU: 1 KG / 15 KG

QI-UP XC

A concentrated chitin derived flotation additive that is natural, biodegradable and non-allergenic, containing no products of animal origin. This is a biopolymer-based formula with a very high surface charge at wine pH and this enhances flocculation.

CONCENTRATED SOLUTION FOR THE FLOTATION OF WHITE, ROSÉ AND RED JUICE

APPLICATION:
- Enhances the speed and performance with which the particles separate from the suspension.
- Alternative to the use of animal products such as gelatin.

USAGE: Mix the Qi-UP XC in 10 times its own weight in water in order to achieve a uniform suspension. In use, the mixture needs to be stirred constantly. A dosing pump or a fining connection is advised.

DOSAGE: 3 - 10 g/hL (white or rosé must) / 10 - 15 g/hL (red must from thermovinification)

SKU: 1 KG

BENT-UP

High-performance, active sodium bentonite granules for flotation.

BENTONITE FOR FLOTATION

APPLICATION:

- Suitable for flotation.
- Effective clarification and sediment compaction.
- Rapid flotation times.
- Remove protein fractions, oxidation enzymes and unstable phenolic fractions.
- Clarification and improved stability.
- Protein elimination in white wines prevent potential cloudiness.
- Removal of reactive polyphenolic fractions reduce the precipitation of colour in the bottle.

USAGE: Add Bent'Up to cold water (ratio 1:20). Leave to stand for 3-6 hours, homogenise the solution and add it to the must or wine while pumping over.

DOSAGE: 30 - 80 g/hL

SKU: 25 KG

QI NO[OX]

Qi No[Ox] consists of polysaccharides from vegetable origin and bentonite that assists with rapid sedimentation. It is an alternative to casein and the first non-allergenic, biodegradable formulation that contains no substances from animal or artificial origins. It has been developed for its anti-oxidative properties, to be used in must or wine.

PREVENT OR TREAT OXIDATION

APPLICATION:
- Removes the brown discolouration.
- Removes caramel and Madeira notes.
- Increases freshness.
- Reduces vegetal notes and bitterness.

USAGE: Disperse Qi No[Ox] in 10 times its own volume of water over an hour whilst stirring. There must be no lumps. Incorporate the suspension into the must or wine through the top of the vessel and blend it via racking and returning. Rack off the preparation after sedimentation is complete (approximately 16 hours for must or one to two weeks in wine).

DOSAGE: 30 - 80 g/hL (must) / 20 - 60 g/hL (white and rosé wine)

SKU: 1 KG

CHAPTER 2: YEAST

INTRODUCTION

In 1680, Antonie van Leeuwenhoek was the first to directly observe yeast cells through a lens. Approximately 200 years later in 1863, Louis Pasteur determined the connection between microscopic yeast cells and the process of fermentation, although the exact mechanism was only determined in the 20th century with the Embden-Meyerhof-Parnas pathway. Finally, in 1890, Herman Müller was the first to isolate pure yeast strains and use it to make wine. Over the course of this evolution, we have reached a point where commercial yeasts for various applications are widely available.

ALCOHOLIC FERMENTATION

In the absence of oxygen, yeast cells produce pyruvate via glycolysis. The pyruvate is then reduced to acetaldehyde, which in turn is reduced to ethanol. The final step of ethanol production 'recharges' the NAD+ co-enzymes that are needed by the yeast cell for various metabolic processes. The yeast most commonly associated with alcoholic fermentation is *Saccharomyces cerevisiae* and it is generally favoured due to its predicted and vigorous fermentation, tolerance of relatively high alcohol and sulphur dioxide concentrations and the ability to thrive in the wine pH range.

FACTORS AFFECTING YEAST METABOLISM

Strain: yeast strains differ in their metabolism and reactions to the fermentation environment.

Fermentation temperature: higher temperatures denature enzymes and damage cells, thereby influencing the alcohol tolerance. Low temperatures decrease the fluidity of the cell and interfere with the ability of the cell to move substrates and metabolites in and out of the cell.

Sugar concentration: determines the osmotic pressure and potential alcohol concentration.

Alcohol content: tolerance is strain dependent.

Rehydration: allows for the adaptation to must conditions and the building of sufficient biomass.

Oxygen availability: is required at the onset of fermentation for cell integrity, but becomes detrimental later in the fermentation.

Nutrient availability: deficiencies have the most negative impact on fermentation performance and can result in the production of off-flavours.

pH: a low pH can be inhibitory to the yeast and high pH requires higher sulphur dioxide dosages to manage indigenous microorganism populations.

Volatile acidity (VA): excessive VA can inhibit the yeast.

Free SO_2: can enter the cell and interfere with the yeast metabolism.

Competition: other yeast and lactic acid bacteria populations can produce by-products that can inhibit the selected yeast strain.

SPONTANEOUS FERMENTATIONS VS INOCULATED FERMENTATIONS

In modern winemaking discussions, 'wild' yeast can refer to either the yeast that are present that were not introduced by intentional inoculation (yeast present on harvest equipment, transport bins, the surface of winemaking equipment and natural flora in the winery) or the non-*Saccharomyces* genera of yeast that have originated from the vineyard, the surface of grapevines and/or grapes and that are usually dispersed via air currents, birds or insects. The main species that are present from the vineyard include species from the genera *Kloeckera*, *Candida* and *Pichia*, with *Kloeckera apiculata* being the most dominant in spontaneous fermentations.

The reason for the selection of a commercial, cultivated yeast culture for inoculation, is the fact that they are very well characterised in terms of their sensory contributions during the fermentation. Significant compounds produced during fermentation include thiols, esters, higher alcohols, volatile acids, aldehydes and terpenes. Research has shown that the yeast has a distinct influence on the final wine aroma profile and the long term effects are only detectable 6-12 months after fermentation.

SPONTANEOUS FERMENTATIONS

- require excellent fruit quality (no rot, spoilage, damage or split berries)
- more time consuming
- difficult to control/ predict
- greater risk of stuck/sluggish fermentations
- perceived to be a more accurate reflection of terroir
- less repeatability from vintage to vintage
- different yeast populations can add to complexity, texture and mouthfeel
- larger risk for spoilage

INOCULATED FERMENTATIONS

- controlled and complete fermentation process
- consistent style and quality
- shorter lag phase and duration of fermentation
- sluggish or stuck fermentations unlikely
- more tolerant to grape defects and nutritional deficiencies
- more temperature and SO_2 tolerance
- enhanced aromatics, colour and varietal characteristics
- predictable sugar to alcohol conversion rate

YEAST MECHANISMS FOR MODIFYING WINE AROMA AND FLAVOUR

1. Secreting enzymes that liberate aroma-active compounds from precursors.
2. Transforming existing grape-derived compounds to aroma-active compounds.
3. Synthesising aroma compounds (de novo).
4. Releasing macromolecules (mainly during autolysis).

The area of wine yeast research is constantly evolving. Scientists are currently working on the artificial engineering of the world's first complex living organism, the yeast *S. cerevisiae,* referred to as Yeast 2.0. They are busy sequencing the 16 chromosomes and 12 million base pair building blocks of DNA in order to better understand the interaction and metabolic processes of *S. cerevisiae* on a genetic level.

There has also been an evolution in wine trends due to a) consumer preferences for wine with less ethanol and fruitier aromas and b) the effects of global climate change on grape ripening and how to produce wines with less ethanol and astringency. For this reason, the focus has also shifted to non-*cerevisiae* species like *S. uvarum* and *S. kudriavzevii*, that display good fermentation kinetics at low temperatures and produce less alcohol and more glycerol.

With so many options and constant innovations in the area of fermentation, it is important to focus on selecting the correct yeast strain for a specific application. In order to do this, consider the variety/ cultivar, the desired style of wine and the fermentation conditions/ technical parameters.

YEAST SELECTION

WHITE WINE PRODUCTION

	Anchor Exotics Mosaic	Anchor Exotics Novello	Anchor Alchemy I	Anchor Alchemy II	Anchor VIN 2000	Anchor VIN 13	Anchor VIN 7	Anchor NT 116	Anchor N 96	Anchor WE 14
Application	**iconic wines**	**iconic wines**	**ester production**	**thiol production**	**complex wines**	**fruity wines**	**thiol production**	**crisp wines**	**sparkling base wines**	**sweet wines**
Blend			■	■						
Hybrid	■	■			■	■		■		
Natural isolate							■		■	■
Restart stuck fermentation						■				
Secondary fermentation									■	
Bio-protection										
Fructophilic	■				■	■				
Cold tolerance	18°C	15°C	12°C	12°C	12°C	10°C	13°C	11°C	11°C	14°C
Alcohol tolerance	15.5%	15.5%	15.5%	15.5%	15.5%	17%	14.5%	16%	16.5%	15%
Osmotolerance	25°B	25°B	25°B	25°B	25°B	27°B	24°B	26°B	27°B	24°B
Nitrogen demand	average	average	average	average	low	low	complex	low	low	high
Sensory descriptors	exotic fruits stone fruits floral mouthfeel	grapefruit guava passion fruit gooseberry fresh and fruity	fruity floral	granadilla guava	floral citrus tropical pineapple papaya	fruity floral terpenes muscat	grapefruit guava passion fruit gooseberry	tropical fruit citrus thiols	neutral	natural sweet wines

	Fermivin LVCB	Fermivin 4F9	Fermivin Champion	IOC 18-2007	IOC Twice	IOC B 2000	IOC BE THIOLS	IOC BE FRUITS	IOC GAÏA
Application	**wines with minerality**	**wines with volume**	**restart fermentation**	**sparkling base wines**	**fresh white wines**	**varietal character**	**fruity thiols**	**fruity esters**	**bio-protection**
Blend									
Hybrid			■				■	■	■
Natural isolate	■	■	■	■	■	■			
Restart stuck fermentation			■	■					
Secondary fermentation				■					
Bio-protection									■
Fructophilic				■					
Cold tolerance	12°C	14°C	15°C	8°C	18°C	12°C	13°C	12°C	0°C
Alcohol tolerance	15%	15.5%	18%	15%	15%	14%	15%	14%	n/a
Osmotolerance	25°B	26°B	30°B	25°B	25°B	24°B	25°B	24°B	n/a
Nitrogen demand	low	average	average	low	very high	low	average	low	n/a
Sensory descriptors	minerality lemongrass pear citrus apricot peach	guava passion fruit volume body	varietal character	MCC production neutral	fresh, complex and balanced fresh citrus aromas peach, apricot and floral roundness with fresh finish	ester aromas varietal notes	fruity thiols	fruity esters red fruit pineapple citrus notes	no sensory contribution

YEAST SELECTION

ROSÉ WINE PRODUCTION

	Anchor Exotics Mosaic	Anchor Exotics Novello	Anchor Alchemy IV	Anchor VIN 13	Anchor NT 116	Fermivin 4F9
Application	**intense mouthfeel**	**thiol style**	**raspberry**	**strawberry**	**crisp**	**mouthfeel**
Blend			■			
Hybrid	■	■		■	■	
Natural isolate						■
Restart stuck fermentation				■		
Secondary fermentation						
Bio-protection						
Fructophilic	■			■		
Cold tolerance	18°C	15°C	16°C	10°C	11°C	14°C
Alcohol tolerance	25°B	15.5%	26°B	17%	16%	15.5%
Osmotolerance	15.5%	25°B	15.5%	27°B	26°B	26°B
Nitrogen demand	average	average	average	low	low	average
Sensory descriptors	stone fruit	thiols freshness	red fruit	strawberry mouthfeel	red berries	thiols

	Fermivin XL	Fermivin Champion	IOC Fresh Rosé	IOC 18-2007	IOC B 2000	IOC GAÏA
Application	**smooth**	**restart fermentation**	**complex**	**sparkling rosé**	**fresh**	**bio-protection**
Blend						
Hybrid						
Natural isolate	■	■	■	■	■	■
Restart stuck fermentation		■				
Secondary fermentation				■		
Bio-protection						■
Fructophilic		■		■		
Cold tolerance	20°C	15°C	14°C	8°C	12°C	0°C
Alcohol tolerance	26°B	18%	16%	15%	14%	n/a
Osmotolerance	15.5%	30°B	26°B	25°B	24°B	n/a
Nitrogen demand	average	average	average	low	low	n/a
Sensory descriptors	red berry	restart	floral, citrus and spicy notes reduce acidity, dryness and bitterness	MCC production neutral	ester aromas and varietal notes	no sensory contribution

YEAST SELECTION

RED WINE STRAINS

	Anchor Exotics Mosaic	Anchor Exotics Novello	Anchor Alchemy III	Anchor Alchemy IV	Anchor NT 202	Anchor NT 50	Anchor NT 116	Anchor NT 112	Anchor WE 372
Application	**iconic wines**	**iconic wines**	**complex wines**	**wines with intense fruit**	**structured wines**	**fruity wines**	**full-bodied wines**	**wines with firm tannin structure**	**wines with floral characters**
Blend			■	■					
Hybrid	■	■			■	■	■	■	
Natural isolate									■
Restart stuck fermentation									
Bio-protection									
Fructophilic	■				■			■	
Cold tolerance	18°C	15°C	16°C	16°C	18°C	13°C	11°C	20°C	16°C
Osmotolerance	25°B	25°B	26°B	26°B	26°B	26.5°B	26°B	26°B	24.5°B
Alcohol tolerance	15.5%	15.5%	15.5%	15.5%	16%	16.5%	16%	16%	15%
Nitrogen demand	average	average	average	average	average	high	low	average	average
MLF compatibility	+++	++	++	++	+++	++	++	+	++
Sensory descriptors	red fruit black fruit cocoa floral	soft tannins red and black fruit	complex esters structure body	intense fruit red fruit smooth	blackberry blackcurrant tobacco prune red berries	blackberry blackcurrant cherry spice	blackberry blackcurrant red berries	structured blackberry blackcurrant	red berry floral

	Anchor WE 14	Fermivin VR5	Fermivin MT48	Fermivin A33	Fermivin XL	Fermivin Champion	Fermivin P21	IOC R 9008	IOC REVELATION TERROIR	IOC GAÏA
Application	**Pinotage**	**wines to be aged**	**fruity, spicy wines**	**structured wines**	**smooth wines**	**restart fermentation**	**fruity red wines**	**wines with longevity**	**wines with finesse**	**bio-protection**
Blend										
Hybrid										
Natural isolate	■	■	■	■	■	■	■	■	■	■
Restart stuck fermentation						■				
Bio-protection										■
Fructophilic						■				
Cold tolerance	14°C	18°C	20°C	22°C	20°C	15°C	12°C	18°C	18°C	0°C
Osmotolerance	25°B	26°B	25°B	26°B	26°B	30°B	25°B	26°B	25°B	n/a
Alcohol tolerance	15%	15.5%	15%	15.5%	15.5%	18%	15%	16%	15%	n/a
Nitrogen demand	high	low	low	high	average	average	average	low	high	n/a
MLF compatibility	++	++	++	++	++	n/a	++	++	++	++
Sensory descriptors	red fruit and cherry in Pinotage	blackcurrant prune cherry spice structure	soft tannins cherry raspberry blackberry plum	blackcurrant blackberry roasted aromas chocolate	red fruit black fruit low astringency roundness	varietal character	blueberry, raspberry and blackberry ageing potential stable colour good mouthfeel	complex ripe fruit aromas volume structure decrease herbaceousness decrease burning sensation of alcohol	colour protection enhance varietal fruit strawberry, gooseberry, blackberry balanced, finesse, elegance	no sensory contribution

PRODUCT CATALOGUE

Anchor Oenology provides you with three distinct ranges of yeast: Anchor, Fermivin and IOC. Anchor is selected and developed for the South African industry and the new-world style of wine production. Fermivin provides the winemaker with a more traditional option, focusing on yeast strains that were mainly selected from Europe and for producing more varietal-style wines. IOC yeast focuses on the production of quality/unique sparkling and still wines.

FOR THE PRODUCTION OF WHITE WINES

Low SO_2 Solutions Suitable for production of low SO_2 wines (R) Restart

EXOTICS MOSAIC

Institute for Wine Biotechnology, Stellenbosch University
S. cerevisiae x S. paradoxus hybrid

ICONIC, BARREL FERMENTED WHITE WINES WITH INTENSE MOUTHFEEL

DESCRIPTORS: guava, granadilla, grapefruit, tropical fruit salad and stone fruit aromas

APPLICATIONS: Chenin blanc, Chardonnay and Viognier

NOTES:
- Fermentations above 18°C.
- High glycerol production.
- Good mouthfeel.
- Fructophilic.
- Pectolytic activity.

DOSAGE: 30 g/hL

SKU: 250 G

EXOTICS NOVELLO

Australian Wine Research Institute
S. cerevisiae x S. cariocanus hybrid

ICONIC, FRESH AND FRUITY WINES WITH THIOL AROMAS

DESCRIPTORS: fruity and floral esters, with enhanced thiol aromas of granadilla and guava

APPLICATIONS: Sauvignon blanc, Chenin blanc and Colombard

NOTES:
- Cold tolerance of 15°C.
- Enhanced softness.
- Decreased tannin intensity, astringency and bitterness.

DOSAGE: 30 g/hL

SKU: 250 G

ALCHEMY I

Australian Wine Research Institute
Yeast blend

WINES WITH FRUITY AND FLORAL ESTERS

DESCRIPTORS: fruity and floral esters, tropical fruit and citrus aromas and some volatile thiols such as granadilla, grapefruit, gooseberry and mango aromas add to complexity

APPLICATIONS: tank fermentations of Sauvignon blanc, Chenin blanc, Chardonnay, Viognier, Riesling and Pinot gris

NOTES:
- Cold fermentation.
- High alcohol tolerance.

DOSAGE: 20 g/hL

SKU: 1 KG

ALCHEMY II

Australian Wine Research Institute
Yeast blend

WINES WITH VOLATILE THIOLS

DESCRIPTORS: granadilla, grapefruit, gooseberry and guava

APPLICATIONS: tank fermentations of Sauvignon blanc, Chenin blanc and Colombard

NOTES:
- Cold fermentation.
- High alcohol tolerance.
- New Zealand style Sauvignon blanc.

DOSAGE: 20 g/hL

SKU: 1 KG

VIN 2000

Institute for Wine Biotechnology, Stellenbosch University
S. cerevisiae x S. cerevisiae hybrid

FULL-BODIED WINES WITH GOOD MOUTHFEEL

DESCRIPTORS: fresh pineapple, papaya, grapefruit, tropical and citrus aromas, floral and fruity aromas

APPLICATIONS: Chardonnay, Chenin blanc and Viognier

NOTES:
- Slower, reliable fermentation rate.
- High alcohol tolerance.
- Fructophilic.
- Highly suitable for barrel fermentations.

DOSAGE: 20 g/hL

SKU: 1 KG

VIN 13

Stellenbosch University
S. cerevisiae subsp. cerevisiae x S. cerevisiae subsp. bayanus hybrid

AROMATIC WHITE WINES

DESCRIPTORS: fresh fruit salad, pineapple, floral and fruity

APPLICATIONS: all white varieties

NOTES:
- Robust and aromatic.
- Fast fermentation rate.
- Extremely sugar, alcohol and cold tolerant.
- Restart stuck fermentations.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

VIN 7

Natural triploid hybrid isolated from Croatia
S. cerevisiae (diploid) x S. kudriavzevii (haploid) hybrid

THIOLIC WHITE WINES

DESCRIPTORS: guava and granadilla, grapefruit and gooseberry

APPLICATIONS: Sauvignon blanc, Chenin blanc and Colombard

NOTES:
- Can foam and produce volatile acidity under stress conditions.
- Ensure sufficient complex nutrition and temperature control.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

NT 116

Agricultural Research Council, Nietvoorbij
S. cerevisiae x S. cerevisiae hybrid

CRISP, AROMATIC WHITE WINES

DESCRIPTORS: tropical fruit salad, zesty citrus and volatile thiols like guava and gooseberry aromas, enhances neutral varieties

APPLICATIONS: Chenin blanc, Chardonnay, Colombard and Pinot gris

NOTES:
- High sugar, alcohol and cold tolerance.
- Intense ester production.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

WE 14

Agricultural Research Council, Nietvoorbij
S. cerevisiae

NATURAL SWEET WHITE WINES

DESCRIPTORS: neutral sensory contribution in white wines

APPLICATIONS: all white varieties

NOTES:
- Resistant to *Botrytis cinerea* toxins.
- Cold sensitivity allows for the arrest of fermentation at the desired sugar concentration.

DOSAGE: 30 g/hL

SKU: 1 KG

N 96

Agricultural Research Council, Nietvoorbij
S. cerevisiae subsp. bayanus

STRONG FERMENTING, ALL-PURPOSE WINE YEAST

DESCRIPTORS: neutral sensory contribution allows varietal character to dominate

APPLICATIONS: all white varieties and MCC wines

NOTES:
- Suitable for cider production.
- Primary and secondary fermentations of MCC wines, as well as cider production.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG

LVCB

Fermivin

Selected by University of Chile
S. cerevisiae subsp. bayanus

MINERAL, FRESH, AROMATIC WHITE WINES

DESCRIPTORS: fruity, fresh aromas, high minerality, hints of lemongrass, pear, citrus and stone fruit

APPLICATIONS: all white varieties

NOTES:
- Fermenting highly clarified must.
- Suitable for secondary fermentation with Charmat method.

DOSAGE: 20 g/hL

SKU: 500 G

4F9

Fermivin

Selected by the French Vine and Wine Institute (IFV), Loire Valley - France
S. cerevisiae subsp. bayanus

AROMATIC WHITE WINES WITH A LONG FINISH

DESCRIPTORS: intense, exotic fruit, guava, passion fruit, well-balanced and round on the palate

APPLICATIONS: all white varieties and wines to be aged on fine lees

NOTES:
- For improvement of wine body and volume.
- Suitable for secondary fermentation with Charmat method.

DOSAGE: 20 g/hL

SKU: 500 G

CHAMPION

R Fermivin

Selected by the French National Institute for Agricultural Research (INRA), Languedoc - France
S. cerevisiae subsp. bayanus

RESTARTING STUCK FERMENTATIONS

DESCRIPTORS: neutral

APPLICATIONS: all white varieties

NOTES:
- Respects varietal character.

DOSAGE: 20 - 30 g/hL

SKU: 500 G

18-2007

R

S. cerevisiae

SPARKLING WINES

DESCRIPTORS: neutral

APPLICATIONS: all sparkling base wines

NOTES:
- Fermentation in the bottle.
- Fermentation under difficult conditions (low temperature and pH).
- Restarting stuck fermentations.
- Respects varietal character.

DOSAGE: 20 g/hL (white wine) / 20 g/hL (restart stuck fermentation and fermentation in the bottle)

SKU: 500 G

TWICE

S. cerevisiae

FRESH, COMPLEX AND BALANCED WHITE WINES

DESCRIPTORS: citrus aromas, lemon, peach, apricot, floral, roundness, freshness

APPLICATIONS: Chardonnay, Viognier, Grenache, Sémillon

NOTES:
- Adapted to tank fermentation.
- For creating wines with a balance between volume and fresh finish.
- Increased intensity of complex fruity aromas.
- Increased fatness and roundness.

DOSAGE: 20 g/hL

SKU: 500 G

B 2000

S. cerevisiae

FRESH AND AROMATIC WHITE WINES

DESCRIPTORS: ester aromas, varietal notes, intense fruity and fresh bouquet

APPLICATIONS: all white varieties

NOTES:
- Use for grapes weak in naturally occurring aromatic precursors.
- Respects varietal character.

DOSAGE: 20 g/hL

SKU: 500 G

SKU AVAILABLE ON PRE-ORDER: 10 KG

BE THIOLS

Low SO_2 SOLUTIONS

S. cerevisiae

WINES WITH FRUITY THIOLS

DESCRIPTORS: citrus and exotic fruits

APPLICATIONS: all white thiol varieties

NOTES:
- Reduced formation of ethanal.
- Low SO_2 production.

DOSAGE: 20 g/hL

SKU: 500 G

BE FRUITS

S. cerevisiae

WINES WITH FRUITY ESTERS

DESCRIPTORS: red fruit, pineapple and citrus notes

APPLICATIONS: all white varieties

NOTES:
- Reduced formation of acetaldehyde.
- Low SO_2 production.

DOSAGE: 20 g/hL

SKU: 500 G

GAÏA

Metschnikowia fructicola

BIO-PROTECTION FOR GRAPES AND MUST

DESCRIPTORS: prevent alcoholic fermentation and spoilage

APPLICATIONS: all varieties

NOTES:
- Reduce pre-fermentation sulphiting.
- Combat natural harmful microflora.
- Facilitates the implantation of selected *S. cerevisiae* starter culture.
- Provides microbial security during grape harvest transport, pre-fermentation maceration, maceration, clarification, cold storage, transport of must and air-drying of grape bunches.

DOSAGE: 7 - 20 g/hL

SKU: 500 G

EXOTICS MOSAIC

Institute for Wine Biotechnology, Stellenbosch University
S. cerevisiae x S. paradoxus hybrid

ICONIC, BARREL FERMENTED ROSÉ WINES WITH INTENSE MOUTHFEEL

DESCRIPTORS: guava, granadilla, grapefruit, tropical fruit salad and stone fruit aromas

APPLICATIONS: all varieties

NOTES:
- Fermentations above 18°C.
- High glycerol production.
- Good mouthfeel.
- Fructophilic.
- Pectolytic activity.

DOSAGE: 30 g/hL

SKU: 250 G

EXOTICS NOVELLO

Australian Wine Research Institute
S. cerevisiae x S. cariocanus hybrid

ICONIC, FRESH AND FRUITY WINES WITH THIOL AROMAS

DESCRIPTORS: fruity and floral esters, with enhanced thiol aromas of granadilla and guava

APPLICATIONS: all varieties

NOTES:
- Cold tolerance of 15°C.
- Enhanced softness.
- Decreased tannin intensity, astringency and bitterness.

DOSAGE: 30 g/hL

SKU: 250 G

ALCHEMY IV

Australian Wine Research Institute
Yeast blend

INTENSE FRUIT ROSÉ WINES

DESCRIPTORS: red fruit aroma intensity like cherry, raspberry, redcurrant and pomegranate, rounded and smooth wines

APPLICATIONS: all varieties

NOTES:
- Stable esters.
- Wines to be aged.
- Terpenes produced.
- Masks green characters.

DOSAGE: 30 g/hL

SKU: 1 KG

VIN 13

Stellenbosch University
S. cerevisiae subsp. cerevisiae x S. cerevisiae subsp. bayanus hybrid

AROMATIC ROSÉ WINES

DESCRIPTORS: fresh fruit salad, strawberry, floral and fruity

APPLICATIONS: all varieties

NOTES:
- Robust and aromatic.
- Fast fermentation rate.
- Extremely sugar, alcohol and cold tolerant.
- Restart stuck fermentations.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

NT 116

Agricultural Research Council, Nietvoorbij
S. cerevisiae x S. cerevisiae hybrid

CRISP, AROMATIC ROSÉ WINES

DESCRIPTORS: tropical fruit salad, zesty citrus and volatile thiols like guava and gooseberry aromas, enhances neutral varieties

APPLICATIONS: all varieties

NOTES:
- High sugar, alcohol and cold tolerance.
- Intense ester production.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

4F9

Fermivin

Selected by the French Vine and Wine Institute (IFV), Loire Valley - France
S. cerevisiae subsp. bayanus

AROMATIC ROSÉ WINES WITH A LONG FINISH

DESCRIPTORS: intense, exotic fruit, guava, passion fruit, well-balanced and round on the palate

APPLICATIONS: all varieties

NOTES:
- For improvement of wine body and volume.
- Suitable for secondary fermentation with Charmat method.

DOSAGE: 20 g/hL

SKU: 500 G

XL

Fermivin

Selected by the University of Santiago - Chile
S. cerevisiae

FRUITY AND SMOOTH ROSÉ WINES

DESCRIPTORS: red and black fruits, low astringency and roundness on the palate

APPLICATIONS: all varieties

NOTES:
- Adsorbs astringent tannins and reduces wine astringency.

DOSAGE: 20 g/hL

SKU: 500 G

CHAMPION

Fermivin

Selected by the French National Institute for Agricultural Research (INRA), Languedoc - France
S. cerevisiae subsp. bayanus

RESTARTING STUCK FERMENTATIONS

DESCRIPTORS: neutral

APPLICATIONS: all varieties

NOTES:
- Respects varietal character.

DOSAGE: 30 - 60 g/hL

SKU: 500 G

FRESH ROSÉ

S. cerevisiae

COMPLEX AND ROUND ROSÉ WINES

DESCRIPTORS: floral, citrus, spice, varietal characters

APPLICATIONS: Shiraz, Cabernet Sauvignon

NOTES:
- Brings out the aromatic intensity of floral, citrus and spicy notes.
- Contributes to mouthfeel.
- Reduces aggressive sensations like acidity, dryness and bitterness.
- Expresses the varietal notes.

DOSAGE: 20 g/hL

SKU: 500 G

18-2007

S. cerevisiae

SPARKLING ROSÉ WINES

DESCRIPTORS: neutral

APPLICATIONS: all sparkling base wines

NOTES:
- Fermentation in the bottle.
- Fermentation under difficult conditions (low temperature and pH).
- Restarting stuck fermentations.
- Respects varietal character.

DOSAGE: 20 g/hL (restart stuck fermentation and fermentation in the bottle)

SKU: 500 G

B 2000

S. cerevisiae

FRESH AND AROMATIC ROSÉ WINES

DESCRIPTORS: ester aromas, varietal notes, intense fruity and fresh bouquet

APPLICATIONS: all varieties

NOTES:
- Use for grapes weak in naturally occurring aromatic precursors.
- Respects varietal character.

DOSAGE: 20 g/hL

SKU: 500 G

SKU AVAILABLE ON PRE-ORDER: 10 KG

GAÏA

Metschnikowia fructicola

BIO-PROTECTION FOR GRAPES AND MUST

DESCRIPTORS: prevent alcoholic fermentation and spoilage

APPLICATIONS: all varieties

NOTES:
- Reduce pre-fermentation sulphiting.
- Combat natural harmful microflora.
- Facilitates the implantation of selected *S. cerevisiae* starter cultures.
- Provides microbial security during grape harvest transport, pre-fermentation maceration, maceration, clarification, cold storage, transport of must and air-drying of grape bunches.

DOSAGE: 7 - 20 g/hL

SKU: 500 G

EXOTICS MOSAIC

Institute for Wine Biotechnology, Stellenbosch University
S. cerevisiae x S. paradoxus hybrid

ICONIC, BARREL-AGED RED WINES

DESCRIPTORS: red and black fruits, violets, cocoa aromas and flavours

APPLICATIONS: Shiraz, Merlot and Pinotage

NOTES:
- Fermentations above 18°C.
- High glycerol production.
- Good mouthfeel.
- Fructophilic.
- Partially degrades malic acid.

DOSAGE: 30 g/hL

SKU: 250 G

EXOTICS NOVELLO

Australian Wine Research Institute
S. cerevisiae x S. cariocanus hybrid

SOFT, FULL-BODIED AND AROMATIC RED WINES

DESCRIPTORS: fresh, fruity and floral red wines with a softened, but structured palate

APPLICATIONS: All red varieties

NOTES:
- Decreased astringency, dryness and bitterness.
- Increased mouthfeel and quality.
- Increased red, black fruit and spicy notes.
- Decreased green and vegetal characters.

DOSAGE: 30 g/hL

SKU: 250 G

ALCHEMY III

Australian Wine Research Institute
Yeast blend

COMPLEX RED WINES

DESCRIPTORS: complex, rose, floral, fruit and raspberry characters with good structure and body

APPLICATIONS: all red varietals

NOTES:
- Stable fruit esters.
- Masks green characters.

DOSAGE: 30 g/hL

SKU: 1 KG

ALCHEMY IV

Australian Wine Research Institute
Yeast blend

INTENSE FRUIT RED WINES

DESCRIPTORS: red fruit aroma intensity like cherry, raspberry, redcurrant and pomegranate, rounded and smooth wines

APPLICATIONS: all red varieties

NOTES:
- Stable esters.
- Wines to be aged.
- Terpenes produced.
- Masks green characters.

DOSAGE: 30 g/hL

SKU: 1 KG

NT 202

Agricultural Research Council, Nietvoorbij
S. cerevisiae x S. cerevisiae hybrid

INTENSE, STRUCTURED AND COMPLEX RED WINES

DESCRIPTORS: red and black fruits, blackberry and blackcurrant, tobacco and prune, fresh plum aromas

APPLICATIONS: Pinotage, Merlot and Cabernet Sauvignon

NOTES:
- Fuctophilic.
- Stimulates MLF.
- Not suitable for cold soaking.

DOSAGE: 30 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 10 KG

NT 50

Agricultural Research Council, Nietvoorbij
Incomplete S. cerevisiae x S. kudriavzevii hybrid

FRUITY, ROUNDED AND EASY DRINKING RED WINES

DESCRIPTORS: strawberry, cherry, blackberry, blackcurrant and some spicy and chocolate aromas

APPLICATIONS: Cabernet Sauvignon, Pinotage, Pinot noir, Merlot, Shiraz and Tempranillo

NOTES:
- Suitable with or without barrel ageing.
- Suitable for cold soaking.
- Masks green characters.
- High glycerol concentration softens the mouthfeel.

DOSAGE: 30 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG

NT 116

Agricultural Research Council, Nietvoorbij
S. cerevisiae x S. cerevisiae hybrid

FULL-BODIED RED WINES FOR BARREL MATURATION

DESCRIPTORS: blackberry and blackcurrant, Bordeaux-style wines

APPLICATIONS: Cabernet Sauvignon and Shiraz

NOTES:
- Intense fruit on the palate.
- Suitable for cold soaking.
- Enhances varietal character.

DOSAGE: 30 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

NT 112

Agricultural Research Council, Nietvoorbij
S. cerevisiae x S. cerevisiae hybrid

RED WINES WITH FIRM TANNIN STRUCTURE

DESCRIPTORS: blackberry and blackcurrant aromas

APPLICATIONS: Cabernet Sauvignon and Shiraz

NOTES:
- Traditional style red wines to be aged.
- Fructophilic.
- Can produce SO_2 under stress conditions.
- Suitable for micro-oxygenation and thermovinification.

DOSAGE: 30 g/hL

SKU: 1 KG

WE 372

Isolated from nature
S. cerevisiae

FRUITY AND FLORAL RED WINES

DESCRIPTORS: strawberry, cherry, raspberry and blackberry, fruity and floral aromas

APPLICATIONS: all red varieties

NOTES:
- Cold sensitive.
- Softer, feminine-style wines.

DOSAGE: 30 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG

WE 14

Agricultural Research Council, Nietvoorbij
S. cerevisiae

FRUITY PINOTAGE WINES

DESCRIPTORS: red fruit and cherry aromas

APPLICATIONS: Pinotage

NOTES:
- Must be co-inoculated with a robust red wine yeast strain.

DOSAGE: 15 - 20 g/hL (in co-inoculation)

SKU: 1 KG

VR5

Fermivin

Selected in Burgundy - France
S. cerevisiae

RED WINES TO BE AGED

DESCRIPTORS: blackcurrant, prune, cherry aromas and spicy hints, rich and plenty of structure, stable colour

APPLICATIONS: all red varieties

NOTES:
- Promotes optimum extraction of polyphenols and stabilization over time.

DOSAGE: 20 g/hL

SKU: 500 G

MT48

Fermivin

Selected by the French Vine and Wine Institute (IFV), Bordeaux – France and Bordeaux Wine Council
S. cerevisiae

FRUITY AND SPICY RED WINES

DESCRIPTORS: expressive wines with soft tannins, cherry, raspberry, blackberry, plum and spices

APPLICATIONS: all red varieties

NOTES:
- Suitable for wines matured for short periods.
- High concentration of glycerol produced.

DOSAGE: 20 g/hL

SKU: 500 G

A33

Fermivin

Selected by the University of Chile
S. cerevisiae

STRUCTURED RED WINES

DESCRIPTORS: blackcurrant and blackberry aromas with roasted and chocolate hints

APPLICATIONS: all red varieties

NOTES:
- Promotes polyphenol extraction and stabilises anthocyanins.

DOSAGE: 20 g/hL

SKU: 500 G

XL

Fermivin

Selected by the University of Santiago - Chile
S. cerevisiae

FRUITY AND SMOOTH RED WINES

DESCRIPTORS: red and black fruits, low astringency and roundness on the palate

APPLICATIONS: all red varieties

NOTES:
- Adsorbs astringent tannins and reduces wine astringency.

DOSAGE: 20 g/hL

SKU: 500 G

CHAMPION

Fermivin

Selected by the French National Institute for Agricultural Research (INRA), Languedoc - France
S. cerevisiae subsp. bayanus

RESTARTING STUCK FERMENTATIONS

DESCRIPTORS: neutral

APPLICATIONS: all red varieties

NOTES:
- Respects varietal character.

DOSAGE: 30 - 60 g/hL

SKU: 500 G

P21

Fermivin

IFV Beaune in Burgundy, France
S. cerevisiae

HIGH QUALITY, FRUITY RED WINES

DESCRIPTORS: blueberry, blackberry and raspberry notes, good mouthfeel, subtle

APPLICATIONS: all red varieties

NOTES:
- Able to ferment at low temperatures (12°C) and suitable for cold soaking.
- Produces stable aromas, stable colour and good structure.
- For the production of wines with good ageing potential.

DOSAGE: 20 g/hL

SKU: 500 G

R 9008

S. cerevisiae

COMPLEX RED WINES FROM MATURE FRUIT

DESCRIPTORS: ripe fruit aromas, unctuous, volume, softness

APPLICATIONS: Merlot, Cabernet Sauvignon, Cabernet franc, Carménère, Malbec, Grenache

NOTES:
- High polysaccharide production limits the burning sensation in high alcohol wines.
- Promotes longevity.
- Decreases the risk of herbaceous aromas and aggressive tannin sensations.
- Minimises the perception of dryness and bitterness.
- Intensifies minerality, salinity and mouthfeel persistence.

DOSAGE: 20 g/hL

SKU: 500 G

RÉVÉLATION TERROIR

S. cerevisiae

FRUITY RED WINES WITH FINESSE

DESCRIPTORS: varietal fruit aromas, strawberry, gooseberry, blackberry, freshness, finesse, elegance

APPLICATIONS: Pinot noir, Merlot, Grenache noir, Gamay, Carignan, Tempranillo

NOTES:
- Excellent ability to preserve colour.
- Increases colour intensity.
- Accentuate varietal aromas.
- Creates a good balance between freshness and maturity of the fruit.
- Enhances the finesse and elegance of the wine.

DOSAGE: 20 g/hL

SKU: 500 G

GAÏA

LOW SO2 SOLUTIONS

Metschnikowia fructicola

BIO-PROTECTION FOR GRAPES AND MUST

DESCRIPTORS: prevent alcoholic fermentation and spoilage

APPLICATIONS: all varieties

NOTES:
- Reduce pre-fermentation sulphiting.
- Combat natural harmful microflora.
- Facilitates the implantation of selected *S. cerevisiae* starter cultures.
- Provides microbial security during grape harvest transport, pre-fermentation maceration, maceration, clarification, cold storage, transport of must and air-drying of grape bunches.

DOSAGE: 7 - 20 g/hL

SKU: 500 G

THE NEW YEAST FOR HIGH QUALITY, FRUITY RED WINES

Fermivin®

The Fermivin® P21 strain has been selected in Burgundy (France) by IFV Beaune (French Institute of the Vine and the Wine) on Pinot noir and Gamay grapes. As a good fermenting strain, Fermivin P21 ensures a complete fermentation.

Fermivin P21 releases a lot of ethyl esters (stable aromatic compounds) and gives the highest Total Polyphenol Index (TPI) among a variety of different commercial yeasts. Also, the extremely high level of HCDC activity (100%), when combined with a high cinnamyl esterase (CE) enzyme can stabilise the colour and prevent the formation of ethyl phenol (EP) by *Brettanomyces*.

As a result, Fermivin P21 gives very fruity wines with good structure for the production of high quality wines with good ageing potential.

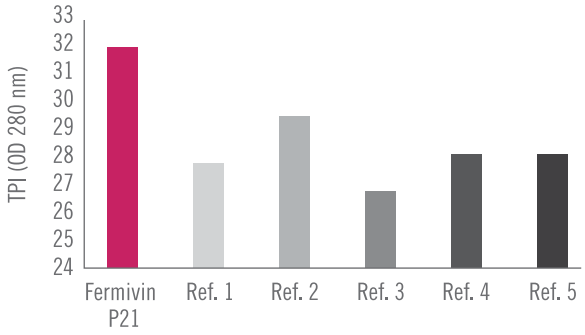


Figure 1. Total Polyphenol Index in different Pinot noir wines fermented with Fermivin P21 and 5 reference strains (Burgundy – France).

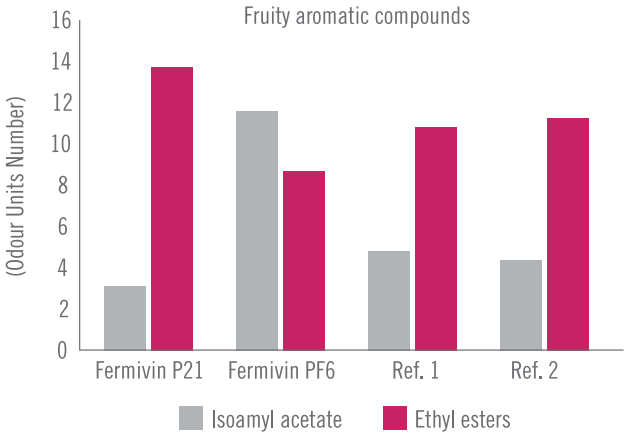


Figure 2. Preference test performed on a Pinot noir wine fermented with Fermivin P21 compared to Fermivin PF6 and two reference strains (Burgundy – France).

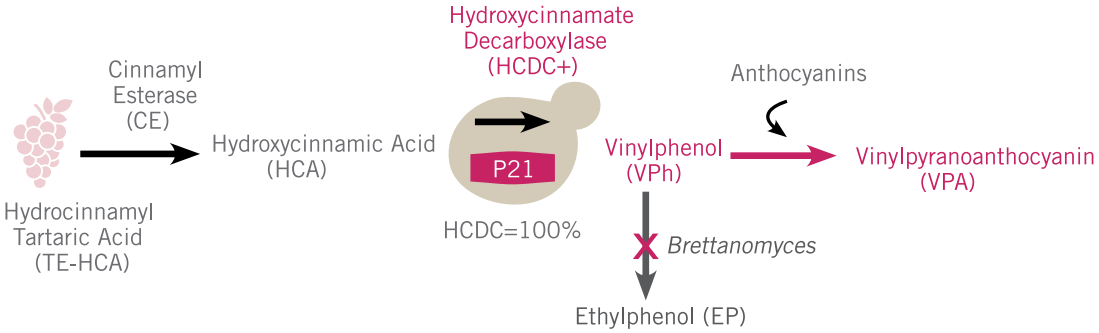


Figure 3. Formation of stable VPA's from successive reactions involving HCDC+ yeast activity.

Fermivin P21 is the new solution in the Fermivin range for high quality and very fruity red wines with good ageing potential.

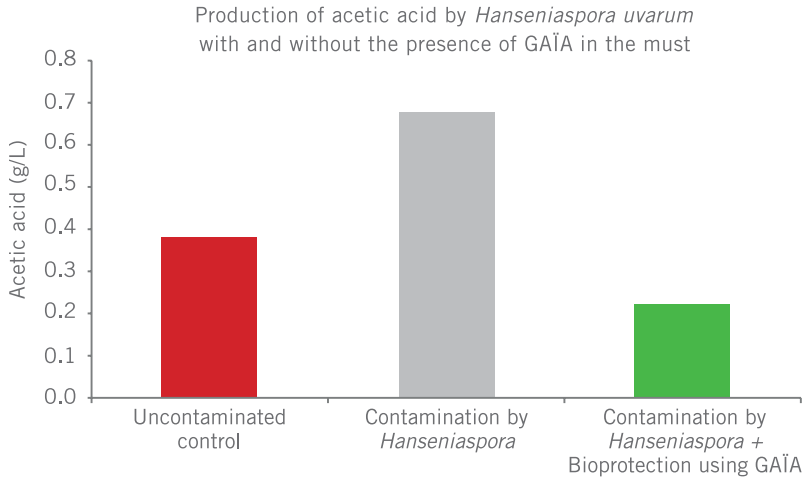
GAÏA AND BIOPROTECTION

From harvest to barrel, the micro-organisms responsible for acetic deviations or the triggering of an unwanted fermentation process may undergo uncontrolled multiplication. Risks are increased by reducing sulphites additions, by temperatures that are too high (>10°C) or if the process takes a long time.

The Institut Français de la Vigne et du Vin (French Wine and Vine Institute) has selected Gaïa, a *Metschnikowia fructicola* yeast with no fermenting power, to combat this harmful flora. It fills an ecological niche by limiting deviations and the risk of triggering an excessively early alcoholic fermentation. Gaïa is a major tool for limiting pre-fermentation sulphiting whether used during vatting or in harvesting trucks. It also facilitates implementation of selected, inoculated *S. cerevisiae* yeasts to guide fermentation, and helps secure the following processes: grape harvest transport, pre-fermenting maceration, "macération de/sur bourbes" (grape lees maceration), skin maceration, must clarification, cold storage and transport of must and air-drying of grape bunches.

PRE-FERMENTING STAGES: KEEPING LIVING BEINGS UNDER CONTROL WITH LIVING BEINGS

Kloeckera apiculata (or *Hanseniaspora uvarum*) is a microorganism capable of producing up to ten times more acetic acid than the *Saccharomyces cerevisiae* oenological yeasts. This wine spoilage yeast is often the cause of acetic differences in pre-fermenting maceration. The use of SO_2 effectively enables the limitation of its growth, however, sometimes large doses are required to reduce the risk down to an acceptable level. In the absence of SO_2, the situation is clearly more random. With Gaïa, the initial population of *Hanseniaspora* is contained and only grows slightly during the pre-fermenting phase. Consequently, the acetic acid content remains very low in comparison to samples contaminated with *Hanseniaspora* but not protected by Gaïa.



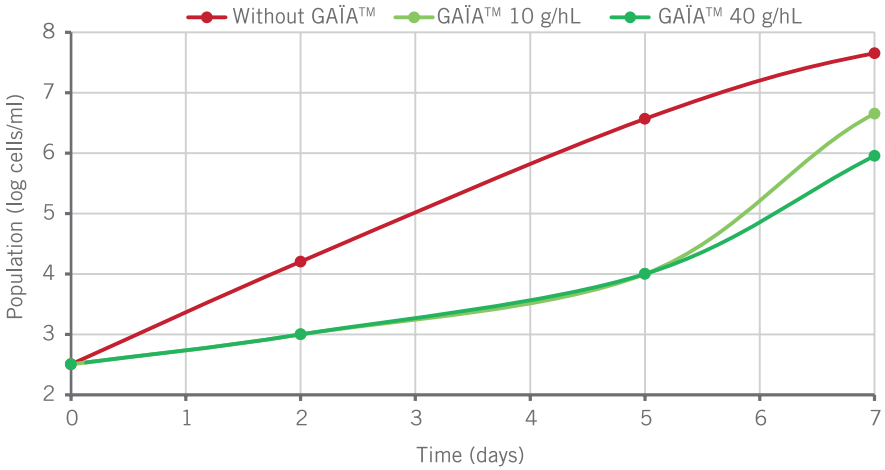
(Sugars 230 g/L, pH 3.20, no SO_2, pasteurisation)
Values of acetic acid after alcoholic fermentation for 14 days – standard deviation: 0.05 g/L.

LIMITING RISKS OF TRIGGERING UNWANTED FERMENTATION

Gaïa achieves its biocontrol by preventing the development of indigenous *Saccharomyces cerevisiae* yeasts during pre-fermenting phases and delays the triggering of the fermentation process. The efficiency of such a delay depends on must temperature. After inoculation with selected *Saccharomyces* yeasts (at sufficient population to trigger fermentation), and as the alcohol increases, the Gaïa population dies off.
Gaïa is also active against acetic bacteria (*Acetobacter, Gluconobacter*) and *Botrytis cinerea*.

The earlier Gaïa is inoculated, the more effective it is in limiting the growth of different micro-organisms.

Monitoring the population of *Saccharomyces* during a pre-fermentation phase at 13°C.



Biocontrol performed by Gaïa on a Saccharomyces cerevisiae *population in pre-fermentation phase (13°C) – must of Chardonnay- Pinot noir blending pH 3.6.*

One of the strategies and tools developed by the IOC for the control of oxidation and microbiological contamination, whether during pre-fermentation, fermentation or ageing, Gaïa is a powerful tool for reducing the overall use and concentration of SO_2 in your wine.

LOW SO_2 SOLUTIONS

CHAPTER 3: NUTRIENTS

INTRODUCTION

Yeast, like any other living organism, has very specific nutritional requirements. Wine yeast strains also differ in their nutrient preferences and therefore the nutrient availability during fermentation will play a vital role in the performance of the yeast strain.

Nutritional needs of wine yeast include, but are not limited to:

- **An available energy source.** Carbon, in the form of sugars like glucose, provide the yeast with the substrate for energy producing reactions (fermentation).
- **Yeast assimilable nitrogen (YAN).** This refers to the nitrogen that is available for uptake and use by the yeast and can originate from both inorganic (ammonia) and organic (amino acids) sources. The yeast requires nitrogen to manufacture proteins required for the construction of cells. The amount of YAN available in the must is dependent on the variety, ripeness level and ripening conditions of the grapes.
- **Minerals (magnesium) and vitamins (thiamine)** that act as growth and survival factors.
- **Phosphate** is used for producing nucleic acids, phospholipids (an important component of the cell membrane) and ATP (energy for metabolism).
- **Potassium** is important for the uptake of phosphates.
- **Biotin** is involved in the synthesis of proteins, fatty acids and nucleic acids.
- **Pantothenic acid** is involved in sugar and lipid metabolism and a shortage can lead to the production of sulphur compounds.
- **Nicotinic acid** is involved in the synthesis of NAD+, the co-enzyme that plays an important role in maintaining the redox balance of the cell, as well as fermentation.
- The yeast also requires **trace elements** of calcium, chlorine, copper, iron, manganese and zinc in order to ensure healthy cell division.
- Yeast are facultative anaerobes and can thus exist in the presence or absence of **oxygen**. However, early exposure to oxidation is imperative for biomass production and to ensure the synthesis of 'survival factors' like ergosterol and lanosterol. Sterols are important in maintaining the selective permeability of the cell, especially in a high osmatic pressure environment with increasing alcohol concentrations.

COMPONENTS OF THE YEAST CELL

Yeast are single cell organisms consisting of the cytoplasma (the inside of the cell containing important organelles like the vacuole), surrounded by the cell membrane that is separated from the cell wall by the periplasmic space.

CELL WALL: gives the cell its shape, acts as a physical barrier and mainly consists of mannoproteins and glucans.

PERIPLASMIC SPACE: contains the glucan and chitin chains that link the cell membrane and cell wall and contains the enzymes responsible for regulating the yeast metabolism.

CELL MEMBRANE: regulates what enters and exits the cell and mainly consists of sterols and lipids that are responsible for membrane integrity. Maintaining the membrane integrity ensures survival under fermentation conditions and effective sugar uptake.

CYTOPLASM: hosts the reactions responsible for sugar to ethanol conversion, as well as the secretion of other by-products like glycerol, acetic acid etc. The vacuole stores enzymes and amino acids required for the synthesis of proteins that are required for sugar uptake, metabolism and biomass formation.

COMPONENTS OF COMMERCIAL PRODUCTS

Nutritional yeast products are based on fractions of the previously mentioned yeast constituents and how they can enhance the fermentation performance of active yeast cells. Product ingredients include:

INACTIVATED YEAST: The whole cell has been inactivated/killed by heat treatment. It contains all of the cell constituents, including the cell wall, membrane and the whole inside of the cell.

YEAST AUTOLYSATE: The whole yeast cell is killed and then treated with glucanase enzymes. This results in the glucan-containing cell wall being partially degraded and the soluble 'inside' of the cell being more accessible to the active, live cells.

YEAST HULLS: This is the insoluble yeast cell wall fraction that can be produced via the centrifugation of the yeast autolysate. Depending on the production process, this fraction could contain some part of the cell membrane.

YEAST EXTRACT: This is the soluble insides of the yeast cells, once the cell wall and membrane have been removed via centrifugation.

TYPE OF COMMERCIAL PRODUCTS

Commercially available yeast nutritional options have also undergone an evolution, shifting from the use of diammonium phosphate (DAP) to the wide variety of products currently available. These include, but are not limited to:

- Complex yeast nutrients
- Detoxification
- Rehydration nutrients
- Rehydration protectants
- Inactivated yeast-based products
- Glutathione-enriched products
- Aroma enhancing nutrients
- Vitamin mixes
- Specific yeast extracts like mannoproteins

COMPLEX YEAST NUTRIENTS

- Mainly consist of inactivated yeast and ammonium salts (DAP).
- Good source of vitamins and minerals.
- Can be enriched with added vitamins (usually thiamine) and minerals (usually magnesium).
- High concentration of organic nitrogen (amino acids).
- WHEN TO USE: to support yeast strains with high nutritional requirements; low YAN musts; to prevent sluggish fermentations; to prevent the production of sulphur off-odours.

REHYDRATION NUTRIENTS

- Mainly inactivated yeast supplemented with either minerals or vitamins or both.
- Contains no ammonium salts.
- Cell membranes damaged during inactivation allow vitamins, minerals, amino acids and nucleic acids to 'leak' out of the cells and can enhance fermentation efficiency and aroma and flavour production.
- WHEN TO USE: juice with a very low YAN; stressful must conditions; to enhance volatile aroma production.

REHYDRATION PROTECTANTS

- Partially autolysed inactivated yeast.
- Partial autolysation makes sterols in the cell membrane more readily available for the fermenting yeast.
- Enhance tolerance to alcohol.
- WHEN TO USE: certain yeast strains under stressful fermentation conditions (low/high fermentation temperatures and high sugar musts); providing vitamins and minerals to fermenting yeast.

YEAST HULLS

- Good adsorption capacity to bind to toxic medium chain fatty acids.
- Detoxification of fermentation environment.
- If part of the cell membrane is included, they can be a good source of sterols and lipids.
- WHEN TO USE: prevent or treat sluggish or stuck fermentations via detoxification; prevent sluggish/stuck malolactic fermentation; treat tainted wines (removal of cork-taint anisoles and Ochratoxin A).

The selection of yeast strain and specific fermentation conditions will dictate which product(s) is/are more suitable to use.

NUTRIENT SELECTION

	Anchorferm	Nutrivin	Nutrivin Super	Natuferm Pure	Natuferm Bright	Natuferm Fruity
Rehydration	■					
Complex		■	■			
Aroma enhancing	■				■	■
Aroma stabilisation and protection						■
Bottle fermentation						
Malolactic fermentation						
Source of organic nitrogen				■	■	■
Nitrogen contribution at 20 g/hL dosage	2 mg/L	30 mg/L	26 mg/L	2.5 mg/L	7 mg/L	7 mg/L
Use in conjunction with additional nitrogen source	■				■	■
CONTAINS:						
Inactivated yeast	■	■	■			
Di-ammonium phosphate		■	■			
Ammonium sulphate		■				
Thiamine	■		■			
Autolysed yeast				■	■	■

	Actiprotect+	Activit Nat	Activit	Extra PM	Phosphates Titres	Nutriflore FML
Rehydration	■					
Complex			■			
Aroma enhancing		■				
Aroma stabilisation and protection		■				
Bottle fermentation				■	■	
Malolactic fermentation						■
Source of organic nitrogen						
Nitrogen contribution at 20 g/hL dosage	n/a	8.5 mg/L	26 mg/L	6 mg/L	42 mg/L	n/a
Use in conjunction with additional nitrogen source	■					n/a
CONTAINS:						
Inactivated yeast	■	■	■	■		■
Di-ammonium phosphate			■		■	
Ammonium sulphate						
Thiamine			■		■	
Autolysed yeast	■					

PRODUCT CATALOGUE

ANCHORFERM

A rehydration nutrient consisting of inactivated yeast to increase yeast viability and fermentation capabilities.

REHYDRATION

APPLICATION:
- Thiamine stimulates yeast growth and metabolism.
- Inactivated yeast are rich in vitamins and minerals and other trace elements required for optimum yeast performance, as well as reducing the risk of stuck fermentation and off-odours.
- Sterols and long chain fatty acids improve alcohol tolerance.

USAGE: Add to rehydration mixture together with yeast.

DOSAGE: 20 g/hL

SKU: 1 KG / 10 KG

NUTRIVIN

Complex nutritional supplement to adjust the yeast assimilable nitrogen.

STANDARD FERMENTATION CONDITIONS

APPLICATION:
- Complex nutrition will stimulate yeast growth and metabolism.

USAGE: Use after the start of fermentation to allow for the uptake of amino acids before addition. Another addition later in the fermentation could be beneficial. Avoid addition at the end of fermentation.

DOSAGE: 20 g/hL

SKU: 1 KG / 10 KG

NUTRIVIN SUPER

Thiamine-enriched complex nutrition formulated for increased stress conditions like high sugar must, low nutrient status and infected grapes.

CHALLENGING FERMENTATION CONDITIONS

APPLICATION:
- Complex nutrition will stimulate yeast growth and metabolism.

USAGE: Use after the start of fermentation to allow for the uptake of amino acids before addition. Another addition later in the fermentation could be beneficial. Avoid addition at the end of fermentation.

DOSAGE: 20 g/hL

SKU: 1 KG / 10 KG

NATUFERM PURE

Natuferm Pure is a source of autolysed yeast that is especially suitable in the case of nitrogen deficiency and/or high potential alcohol percentage. Its high nutrient content promotes yeast growth and the rapid completion of fermentation, whilst also preserving the aromatic typicity of each grape variety. Natuferm Pure increases the yeast's production of aromatic esters.

A YEAST-DERIVED NUTRIENT SOURCE OF ORGANIC NITROGEN

APPLICATION:
- Ensures regular, complete alcoholic fermentation.
- Ensures the yeast can withstand nitrogen deficiencies and/or must with high potential alcohol.
- Preserves and enhances the aromatic typicity of grape varieties.
- Contributes to the biosynthesis of esters.
- High in amino acids.
- High in trace elements.

USAGE: 100% *Saccharomyces cerevisiae* yeast autolysate in micro-granulated form for quick, easy suspension. Suspend Natuferm Pure in 10 times its weight in must. Incorporate during the first third of the alcoholic fermentation by pumping over after addition. Do not add ammonium salts at the same time. Inorganic nitrogen should be added after the first third of alcoholic fermentation.

DOSAGE: 20 - 40 g/hL (depending on the must's initial YAN content and/or potential alcohol strength)

SKU: 1 KG

NATUFERM BRIGHT

Natuferm Bright is a yeast autolysate. It is very high in amino acids (aroma precursors), which play an important role in assisting the yeast in the release of thiols during alcoholic fermentation. Its high ergosterol content – essential for yeast cell functioning – also make it a suitable nutrient for extreme fermentation conditions.

ENHANCED AROMA PRODUCTION IN WHITE AND ROSÉ WINES

APPLICATION:
- Promotes the release of aromatic thiol and ester compounds.
- Maintains the ability of the yeast to ferment sugars.
- Corrects small assimilable nitrogen deficiencies.

USAGE: 100% *Saccharomyces cerevisiae* yeast autolysate in micro-granulated form for quick, easy suspension. Suspend Natuferm Bright in 10 times its weight in must. For best results, incorporate in two stages: add the first dose at inoculation and the second dose after the first third of alcoholic fermentation. In the event of severe nitrogen deficiency, we recommend supplementing with 20 g/hL Nutrivin Super for fermentation.

DOSAGE: 30 - 40 g/hL

SKU: 1 KG

NATUFERM FRUITY

Natuferm Fruity is an autolysed yeast, selected for its richness in amino acids that act as precursors for the production of ester aromas during alcoholic fermentation.

ENHANCED FRUITINESS IN RED WINES

APPLICATION:
- Provides organic nitrogen, an efficient form of YAN to ensure achievement of fermentation.
- Rich in ergosterol to preserve yeast membrane fluidity and viability until the end of fermentation.
- Naturally rich in vitamins.
- Naturally rich in amino acids, precursors of fruity esters.
- Tendency to preserve PDMS (of which the production is yeast strain dependent), to increase the longevity of fruity aromas and impact the qualitative ageing aromas of the wine.
- Efficient fermentation avoids the formation of unwanted reductive aromas.

USAGE: To be added at the beginning of the alcoholic fermentation, at the same time as the must is inoculated with the yeast. Suspend Natuferm Fruity in water or must, 10 times its weight.

DOSAGE: 20 - 40 g/hL

SKU: 1 KG

ACTIPROTECT+

A rehydration nutrient used to increase yeast fermentation capacity.

YEAST PROTECTION

APPLICATION:
- Strengthens the yeast membrane making it stronger and more resistant to the stresses of fermentation.
- Decreases the duration of the lag phase.
- Increases the fermentation capacity of the yeast.
- Makes the yeast more resistant to osmotic stresses during inoculation.

USAGE: Add Actiprotect+ directly to the rehydration mixture. Mix 1 kg of Actiprotect+ in 10 L of water at 42°C. Wait for the temperature to decrease to 38-40°C before adding the yeast.

DOSAGE: 20 g/hL

SKU: 1 KG

ACTIVIT NAT

Activit Nat is a fermentation activator consisting of inactivated yeast. This nutrient provides amino acids, small peptides and stress resistance factors that are adsorbed by the yeast throughout alcoholic fermentation. This activator is intended for musts with low or moderate nitrogen deficiencies. It does not compensate for particularly high nitrogen deficiencies.

FERMENTATION ACTIVATOR

APPLICATION:
- Balanced alcoholic fermentation.
- Completion of alcoholic fermentation.
- Contributes to organoleptic quality of the wine.
- Reduces the risk of the production of sulphur compounds.

USAGE: Put Activit Nat in solution into 10 times its weight of must or wine and incorporate the mixture into the tank. Carry out a pumpover with aeration to homogenise.

DOSAGE: 20 g/hL (must), followed with 20 g/hL (during first third of alcoholic fermentation)

SKU: 1 KG

ACTIVIT

A mixture of ammonium salts, inactivated yeast and thiamine, to be used during a sluggish alcoholic fermentation and will also maintain the fermentation when there is a nitrogen deficiency in the must.

SLUGGISH ALCOHOLIC FERMENTATION

APPLICATION:
- Provides inorganic and organic nitrogen.
- Adsorption of short chain fatty acids that can inhibit fermentation.
- Provides sterols and long chain fatty acids which are essential precursors in maintaining yeast viability.

USAGE: Dissolve in 10 times its weight in must or wine and add to the juice via pumpover. If using it to restart a fermentation, add the product to the wine prior to yeast addition.

DOSAGE: 20 - 40 g/hL (preventative treatment and mid-fermentation) / 40 - 50 g/hL (restart a stuck fermentation)

SKU: 1 KG

EXTRA PM

Extra PM is a fermentation activator specifically intended for bottle fermentation and contains inactivated yeast that is naturally rich in glutathione.

FERMENTATION ACTIVATOR FOR BOTTLE FERMENTATION

APPLICATION:
- Guarantees optimal yeast activity during bottle fermentation.
- Retains membrane exchange capacity, especially in the case of continuous yeast starter cultures.
- Guarantees the optimal physiological state of the yeast, especially after 2.5 kg pressure.
- Improved wine ageing potential.
- Limits reduction phenomena during bottle fermentation.
- Conservation of varietal and fruity aromas.
- Enhances roundness, elegance and length in sparkling wines.

USAGE: Put Extra PM into solution in 10 times its weight of wine and incorporate into the mixture. The use of Extra PM must be accompanied by an addition of Phosphates Titres into the mixture, in order to secure the bottle fermentation.

DOSAGE: 10 - 30 g/hL

SKU: 1 KG

PHOSPHATES TITRES

Phosphates Titres contains diammonium phosphate and thiamine to ensure regular yeast multiplication and complete and regular sugar utilisation. It is recommended for sparkling wine production.

FERMENTATION ACTIVATOR FOR SPARKLING WINES

APPLICATION:
- Thiamine helps to maintain yeast viability.
- Encourages fast start to alcoholic fermentation.
- Ensures an even supply of nitrogen right to the end of fermentation.
- Optimise fermentation efficiency.

USAGE: Dissolve Phosphates Titres in 10 times the volume of cold water before adding to the wine.

DOSAGE: 5 g/hL

SKU: 1 KG / 5 KG

NUTRIFLORE FML

Nutriflore FML is a nutrient based on inactivated yeast selected for their high level of nutrition and survival factors and is designed to accelerate malolactic fermentation.

MALOLACTIC FERMENTATION

APPLICATION:
- Provides elements required for the proper growth of the bacteria (amino acids, minerals and vitamins).
- Provides peptides needed by the bacteria to increase resistance to the wine acidity.
- Effective for wines with a low pH (<3.4).

USAGE: It is recommended to add Nutriflore FML 48 hours before inoculating with bacteria, but it can also be added at the time of inoculation. For the best dispersion, prepare a suspension beforehand in a small quantity of water or wine.

DOSAGE: 20 g/hL

SKU: 1 KG

THE DEDICATED AUTOLYSED YEAST BOOSTING AND PRESERVING THE FRUITINESS OF RED WINES

Natuferm® Fruity is an autolysed yeast, selected for its richness in amino acids and precursors of fermentative esters, responsible for the fruitiness of the wines. The natural content of ergosterol is an added value as this lipid is necessary for yeast in order to protect their membrane and ensure their capacity to uptake and then transform amino acids into esters.

Natuferm Fruity naturally provides vitamins and oligo-elements, key nutritional compounds for yeast to ensure a quick and complete fermentation.

The tasting (Figure 1) made on a Shiraz wine (standard winemaking, 2018 vintage) with Natuferm Fruity is showing a positive impact on the sensorial profile of the wine. This wine is preferred due to the quality of red fruit aromas and varietal characteristics of Shiraz wines. With Natuferm Fruity the wine is less bitter, and more fresh with a better expression of the aroma.

The use of Natuferm Fruity also produces less masking aromas (Figure 1).

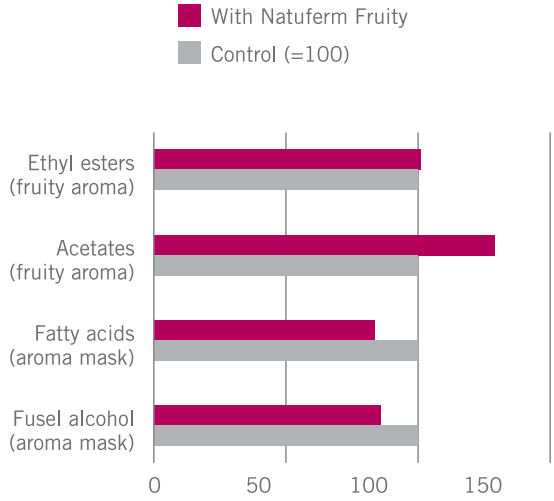


Figure 1. 2018 Syrah – Traditional method of winemaking.
Natuferm Fruity at 40 g/hL added at inoculation.
Must: 115 mg/L of YAN, 13% alcohol potential, pH 3.6.
IFV panel – 8 tasters (France).

The same trend (Figure 2) is observed in thermovinified Shiraz wine (2018 vintage). The wine with Natuferm Fruity is significantly different and preferred by the 8 tasters for its fruitiness.

A better preservation of Potential Dimethyl Sulfur (PDMS) on the Syrah fermented with Natuferm Fruity at 40 g/hL is also provisionally observed. PDMS, progressively releasing DMS, a strong fruity enhancer, helps to preserve the wine fruitiness during ageing in bottles.

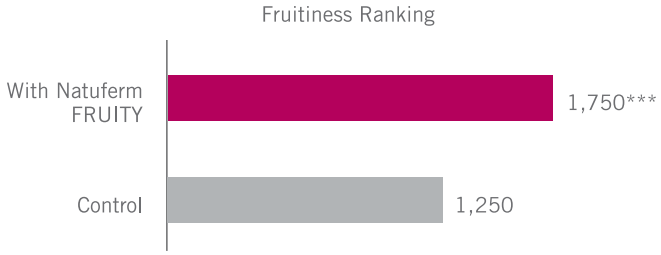


Figure 2. 2018 Shiraz with thermoflash.
Vinification with Natuferm Fruity and without (control).
*** significant at 1%.

CHAPTER 4: BACTERIA

INTRODUCTION

'A second fermentation in young wines' was first described in 1837. By 1913, Müller-Thurgau and Osterwalder explained the bacterial degradation of malic to lactic acid and CO_2 according to the formula:

$$C_4H_6O_5 \rightarrow C_3H_6O_3 + CO_2$$

This was called biological de-acidification or malolactic fermentation (MLF). In the 1960's, studies focused on discovering methods that stimulate indigenous lactic acid bacteria (LAB). This eventually evolved to focus on ways to isolate highly active wine LAB strains for use as MLF starter cultures. Initially, the impact of MLF was thought to be a simple de-acidification step, that increased the microbial stability with a decrease in the nutrient content, whilst having an impact on the buttery notes. Since then, many studies have proven the ability of LAB to generate a large number of compounds that have an impact on the sensory profile of the wine that extend beyond just increased butteriness.

Whilst there are many different LAB entering the juice and wine from the grape berry surface, cluster stems, wines, leaves and soil and winery equipment, only some LAB are able to grow due to the selective environment of juice and wine. LAB present in wine all have the following in common: they are gram-positive, non-mobile, non-sporulating facultative anaerobes, that require a nutritionally rich medium, fermentable sugars and display optimum growth temperatures of 20-30°C. LAB genera most commonly found in must and wine include *Oenococcus oeni, Lactobacillus* and *Pediococcus*.

FACTORS INFUENCING THE SURVIVAL AND GROWTH OF LACTIC ACID BACTERIA

- **The chemical and physical composition of the wine**. The wine pH exerts the strongest selective action and largely determines: which LAB will be present; bacteria viability; growth rate; speed of MLF and the metabolic behaviour. Other important parameters include the SO_2 concentration (interaction with pH), alcohol percentage and temperature.
- **Factors associated with the winemaking process**. Practices like clarification can remove LAB and also negatively impact nutrient availability. The timing of bacteria inoculation will also influence the MLF and sensory outputs.
- **The interaction between LAB and other microorganisms**. Relationships with other indigenous populations of yeast and bacteria, inoculated yeast, other fungi, acetic acid bacteria and bacteriophages, can be either synergistic or antagonistic.

THE EFFECTS OF MALOLACTIC FERMENTATION ON WINE COMPOSITION AND QUALITY

REDUCTION IN ACIDITY

L-malic acid is catabolised to the weaker L-lactic during MLF, with a corresponding loss in acidity. This decrease can vary due to the buffering capacity of the wine, as well as initial pH, but the acid will typically decrease by 1 to 3 g/L and the pH may rise by 0.1 to 0.3 units.

FLAVOUR CHANGES

The decrease or increase in certain wine aroma and flavour attributes is dependent on the bacteria strain characteristics, the intensity of the varietal aroma characteristics and the winemaking techniques employed. Besides de-acidification, flavour descriptors for wines that have undergone MLF include: buttery, lactic, nutty, yeasty and oaky, as well as impacting fruity and vegetative aromas and mouthfeel. The mechanisms by which LAB can modify the wine flavour include:

- the removal of existing flavour compounds due to adsorption to the cell wall;
- the production of new flavour compounds via the metabolism of sugars, amino acids and other substrates;
- the metabolism of grape and yeast-derived secondary metabolites to lesser or more flavourful compounds.

Diacetyl

The production of diacetyl via citric acid metabolism increases the buttery, nutty aromas. Depending on the wine type and style, low amounts of diacetyl can contribute positive buttery notes, but can at high concentrations, be considered spoilage. In order to increase the diacetyl content consider: selecting a strong diacetyl-producing strain, lower bacteria inoculation rate, lower pH and temperature, shorter lees contact, higher redox potential and stabilisation of the wine immediately after the completion of malic and citric acid metabolism.

Mouthfeel

The impact on mouthfeel could possibly be associated with the biosynthesis of exocellular polymers, such as polysaccharides; the production of glucans or the metabolism of existing polysaccharides via β-glucanase activity. MLF can also increase anthocyanin and tannin condensation which reduces the astringency in red wines.

Fruity and vegetative aromas

Wine LAB are able to produce certain esters, like ethyl lactate and isoamyl acetate, whilst also displaying esterase activity that could impact the aroma profile. Enhanced fruity aromas during MLF have also been associated with the decrease in vegetative aromas.

Grape-derived precursors

Wine LAB that exhibit glycosidic activity can hydrolyse glycoside precursors via enzymatic activity and release volatile aroma compounds like nor-isoprenoids, volatile phenols, monoterpenes and aliphatics.

Acetaldehyde and other carbonyls

During MLF, the concentration of acetaldehyde and other carbonyls generally decrease.

Oak influence

Wine LAB can metabolically interact with oak compounds. As a result, wines that have undergone MLF in barrel, are described as softer, richer and fuller in flavour and less astringent, with a tendency to exhibit more colour, compared to MLF in stainless steel tanks.

Amino acids

A variety of amino acids can be utilised by LAB to produce volatile sulphur compounds (methionine), N-heterocycles (ornithine and lysine) and biogenic amines.

In recent years, the focus has shifted from only *O. oeni* and sequential inoculation, to other genera also suitable for MLF, various inoculation scenarios, as well as the selection of bacteria strains largely being influenced by their sensory impact in the wine. Winemakers now have the option to select *Lactobacillus plantarum* starter cultures (pure or mixed), as well as whether to inoculate yeast and bacteria at the same time (co-inoculation). Once again, all the options and scenarios will have varying effects on the wine and wine sensory profile and the winemaker has to select the most suitable options based on the preferred wine style and practical considerations in the cellar.

BACTERIA SELECTION

	Anchor Duet Arom	Anchor Duet Soft	Anchor Solo Select	IOC Inobacter
Application	**fruity and spicy notes**	**mouthfeel and softness**	**balance and structure**	**difficult conditions**
Co-inoculation/Sequential	co-inoculation	co-inoculation	sequential	sequential
Freeze-dried				
Red wine				
White wine				
Sparkling wine				
Oenococcus oeni				
Lactobacillus plantarum				
Optimum temperature	18-28°C	15-28°C	14-28°C	18-22°C
Alcohol tolerance	16%	15%	16%	14%
pH tolerance	≥3.5	≥3.2	≥3.2	≥2.9
TSO_2 tolerance	50 ppm	50 ppm	50 ppm	60 ppm

PRODUCT CATALOGUE

DUET AROM

Department of Viticulture and Oenology, Stellenbosch University
Bacteria blend of Oenococcus oeni x Lactobacillus plantarum

ENHANCED FRUITY AND SPICE NOTES

APPLICATION:
- Enhanced aroma intensity.
- Red fruit characters via ester production.
- Enhanced spicy notes.
- Increases terpenes and norisoprenoids that enhance fruity and floral characteristics.

USAGE: Co-inoculation - inoculate on the same day as the yeast. Rehydration in chlorine-free water for no more than 15 minutes.

DOSAGE: 1 g/hL

SKU: 25 G (25 HL)

DUET SOFT

Institute for Wine Biotechnology, Stellenbosch University
Bacteria blend of Oenococcus oeni x Lactobacillus plantarum

ENHANCED MOUTHFEEL AND SOFTNESS

APPLICATION:
- Enhanced mouthfeel.
- Decreased green characters.
- Reduced astringency.
- Enhanced dark fruit aromas.

USAGE: Co-inoculation - inoculate on the same day as the yeast. Rehydration in chlorine-free water for no more than 15 minutes.

DOSAGE: 1 g/hL

SKU: 25 G (25 HL)

SOLO SELECT

Australian Wine Research Institute
Oenococcus oeni

STRUCTURE AND BALANCE

APPLICATION:
- Ensure a secure malolactic fermentation.
- Enhance structure.
- Increase spicy and dark fruit aroma notes.
- Increase overall balance of the wine.
- Restart stuck malolactic fermentation.

USAGE: Sequential inoculation - for best distribution, rehydrate the packet of freeze-dried bacteria in 20 times its weight of chlorine-free water at 20°C for a maximum of 15 minutes. Add the suspension to the must or wine to be fermented. Direct inoculation is possible. Open the sachet and add the bacteria directly during a pumpover.

DOSAGE: 1 g/hL

SKU: 25 G (25 HL)

INOBACTER

Oenococcus oeni

LOW PH MUST AND WINE

APPLICATION:
- Tolerant of very low pH conditions (>2.9).
- Requires three steps: reactivation, starter culture and inoculation.

USAGE: Suitable for co-inoculation, inoculation during alcoholic fermentation or sequential inoculation. The Inobacter kit contains a sachet of oenological bacteria and a sachet of special activator. Contact your technical sales manager for instructions for use.

DOSAGE: 0.72 g/hL (bacteria) / 4 g/L (reactivation medium)

SKU: 25 HL / 100 HL / 1000 HL

ANCHOR SOLO SELECT: A BRAND NEW ROBUST CULTURE FOR SECURE MALOLACTIC FERMENTATION

Anchor Solo SELECT was isolated from the Yarra Valley in Australia and selected by the Australian Wine Research Institute for its ability to ferment under a wide range of conditions. Anchor Solo SELECT is an *Oenococcus oeni* bacteria. In addition, achieving malolactic fermentation with this robust culture will enhance complexity and structure, as well as some dark fruit and spicy characters in the wine.

TECHNICAL PROPERTIES

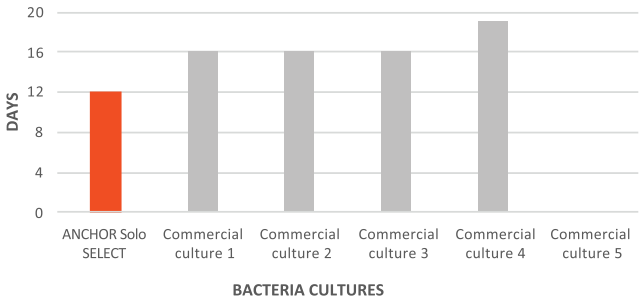
pH tolerance	> 3.2
Alcohol tolerance	< 16%
SO_2 tolerance	< 50 mg/L TSO_2
Temperature tolerance	>14°C
Nutrient demand	medium

SOLO SELECT

- Recommended for use in red wines
- Displays good implantation and efficient fermentation kinetics
- Enhances structure and complexity
- Enhances spicy and dark fruit notes
- Low volatile acidity production
- Late degradation of citric acid and thus low diacetyl production
- No production of biogenic amines
- Can be used for both co-inoculation and sequential inoculation

DURATION OF MLF

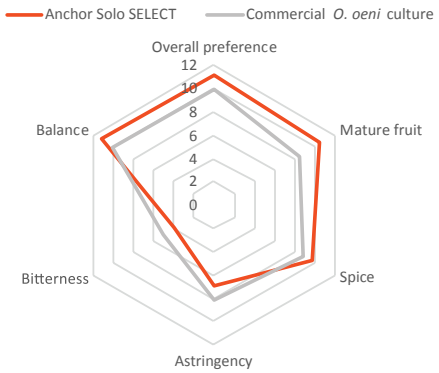
Days to complete MLF in a Cabernet Sauvignon (Gaillac, France)
(14.3% alcohol I pH 3.4 I 1.5 g/L malic acid)



A comparison of the malolactic fermentation duration during sequential inoculation comparing Anchor Solo SELECT with five commercial *Oenococcus oeni* cultures.

The robust Anchor Solo SELECT completed the MLF a minimum of four days faster than any of the other commercial strains.

SENSORY IMPACT



A comparison of Anchor Solo SELECT and a commercial *Oenococcus oeni* culture in Merlot (Bordeaux, France).

Anchor Solo SELECT enhances the balance and spicy characters in the wine.

NOTES

CHAPTER 5: ENZYMES

INTRODUCTION

The first production of an enzyme on an industrial scale, occurred in France in 1922. Enzymes are proteins that accelerate chemical reactions by facilitating the reaction, but not actively taking part as a substrate or product. Endogenous enzymes naturally present in must, tend to show reduced effectiveness due to their sensitivity to sulphur dioxide, tannins and alcohol.

The production process of commercial enzyme preparations involve the cultivation of selected microorganisms (*Aspergillus niger* and *Trichoderma*) in fermenters under aerobic conditions. The composition of the growth media favours the production of certain enzymes, which are then isolated via centrifugation, ultra-filtration and concentration. Through this process, the microorganism is eliminated and the enzyme with main and side/secondary activities remain. Commercial enzymes are available in micro-granulated form (storage at room temperature; 24-36 month shelf-life) or liquid formulations (cold storage; 12-24 month self-life).

THE GRAPE BERRY

The main application of enzyme usage in winemaking is to break down grape pulp and berry skin cells. The composition of the grape berry is mainly dependent on the cultivar, soil and climate conditions.

The grape skin comprises approximately 6-9% of the grape berry mass and contains mainly anthocyanins, tannins, aroma compounds and aroma precursors. The main objective of the cell walls of the grape berry skin cells is to ensure that rigidity and separation of the inner cellular components from outside the cell. The grape berry pulp comprises approximately 75-85% of a mature berry and mainly consists of pectin polysaccharides, organic acids and fermentable sugars.

The cell walls of the berry are highly complex structures of cellulose microfibrilles linked by a matrix of xyloglucan, mannan, xylan (also known as hemi-cellulose) and pectin, all consolidated by a secondary protein network. It is the main pectin component found in the primary cell wall and in the sheath between the skin and pulp cells, that poses a challenge during vinification:

- the complex pectin structure consists of homogalacturonan and rhamnogalacturonan I and II units, combined via covalent acidic links;
- during berry ripening, the endogenous (naturally present) enzymatic pectinase activity softens the berry by breaking down the pectin (becomes soluble pectin);
- this soluble pectin is released into the must during pressing;
- soluble pectin is very viscous and hinders: juice extraction, clarification and filtration; prevents the diffusion of phenolic and potential aroma compounds during vinification.

Due to the challenges posed by the grape berry structure, commercial enzyme preparations focus on four main enzyme families: pectinases, glycosidases, β-glucanases and secondary activities. These enzyme formulations can be used to achieve and enhance quantitative, qualitative and processing benefits.

PECTINASES

- consist of pectin lyase (PL), pectin methyl-esterase (PME) and polygalacturonase (PG) enzyme activity
- the polysaccharides in the cell wall and middle sheath are hydrolysed to remove the physical barrier preventing diffusion of anthocyanins, tannins and aroma precursors
- weakens the cell walls of the pulp and hydrolyses the soluble pectin
- decreases the viscosity due to pectin hydrolysis and electrostatic turbidity destabilisation then leads to sedimentation

Main impact:

- IMPROVED COLOUR INTENSITY AND STABILITY
- INCREASED AROMA PRECURSOR EXTRACTION
- INCREASE FREE-RUN AND PRESS JUICE YIELDS
- INDUCE CLARIFICATION
- IMPROVE FILTRATION

GLYCOSIDASES

- maximise the aromatic potential by increasing the extraction process
- odourless aromatic precursors are present in the grape skin in a form linked to sugars
- sequential hydrolysis of the sugars release volatile aroma compounds like terpenols, esters and nor-isoprenoids

Main impact:

- RELEASE BOUND AROMA COMPOUNDS

β-GLUCANASES

Main impact:

- IMPROVED FILTRATION OF *BOTRYTIS* MUST
- ENHANCED YEAST AUTOLYSIS through a reduction in the time required, as well as increasing the quantity of released yeast compounds

SECONDARY ACTIVITIES

- can be beneficial or detrimental
- hemi-cellulases usually accompany pectinase formulations
- cinnamyl esterases lead to the production of vinyl phenols: beneficial in red wines when reacting with polyphenols to form stable colour compounds; detrimental in white wines and causes off-odours
- anthocyanases are detrimental to colour

It is imperative to select an enzyme formulation based on the requirements of the winery, keeping in mind that the enzymatic activity will be influenced by: the temperature (lower temperatures slow down activity and higher temperatures denature the enzyme); the contact time and the dosage (determine by the grape variety, process, temperature and contact time).

ENZYME SELECTION

	Rapidase Expression Aroma	Rapidase Extra Press	Rapidase Clear	Rapidase Clear Extreme	Rapidase Flotation	Rapidase Batonnage	Rapidase Extra Fruit
White and rosé wine	■	■	■	■	■	■	
Red wine						■	■
Juice from thermovinification							
Liquid		■	■		■		
Granulated	■		■	■		■	■
PRIMARY ACTIVITY:							
Pectinases (primary chains)	■	■	■	■	■	■	■
β-Glucanases						■	
SECONDARY ACTIVITY:							
Pectinases (side chains)	■	■		■			■
Hemicellulases		■					■
Rhamno galacturonases							■
Arabinosidases Rhamnosidases Apiosidases	■						

	Rapidase Extra Color	Rapidase Fast Color	Rapidase Filtration	Inozyme	Inozyme Clear	Inozyme Terroir	Extrazyme MPF	Extrazyme Terroir
White and rosé wine			■	■	■	■	■	
Red wine	■	■	■				■	■
Juice from thermovinification						■		
Liquid		■	■					
Granulated	■			■	■	■	■	■
PRIMARY ACTIVITY:								
Pectinases (primary chains)	■	■	■	■	■	■	■	■
β-Glucanases			■		■			
SECONDARY ACTIVITY:								
Pectinases (side chains)	■	■	■		■		■	■
Hemicellulases	■	■		■		■	■	■
Rhamno galacturonases	■	■						
Arabinosidases Rhamnosidases Apiosidases			■					

ENZYMES FOR WHITE AND ROSÉ WINE APPLICATION

Low SO_2 Solutions Suitable for production of low SO_2 wines

EXPRESSION AROMA

RAPIDASE

An enzyme for fast, early and targeted aroma precursor extraction in white grape maceration. Skin contact allows for enhanced aroma intensity and complexity. Sufficient skin integrity is maintained to ensure effective downstream processing.

AROMA PRECURSOR EXTRACTION IN WHITE WINES

APPLICATION:
- Skin and pulp cell wall degradation.
- Reduces maceration time.
- Replaces more oxidative mechanical methods.
- Increased thiol extraction.

USAGE: Add as early as possible at the crusher, in maceration or in the press. Use the maximum dosage for thick skinned grapes or early harvested fruit. Dilute 10 times prior to addition. Active from 10-45°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite.

DOSAGE: 2 - 4 g/100 kg

SKU: 100 G

EXTRA PRESS

RAPIDASE

Enzyme for fast, efficient pressing of white grapes. Use of this enzyme allows for the release of juice from white grapes by weakening grape skins and reducing pectin water retention capacity.

EFFICIENT GRAPE PRESSING

APPLICATION:
- Pectin and insoluble protopectin degradation.
- Increases juice yield.
- Allows for softer and shorter pressing cycles and thus preserves grape must from oxidation.
- Increased percentage of free-run and press juice.

USAGE: Add as early as possible on grapes upon reception or after crushing in non-oxidative conditions. Avoid immediate draining after enzyme addition to allow distribution of the enzyme on the grapes. Use maximum dosage on whole cluster grapes. Dilute 10 times prior to addition. Active from 10-45°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite.

DOSAGE: 1.5 - 2.5 ml/100 kg

SKU: 1 KG / 5 KG / 20 KG

CLEAR

RAPIDASE

This is an enzyme for fast and efficient grape must and wine clarification. Rapidase Clear decreases the viscosity allowing for more compact lees and clearer must and wine.

CLARIFICATION OF GRAPE MUST

APPLICATION:
- Pectin degradation.
- Decrease in lees percentage.
- Decrease in turbidity.

USAGE: Available in granulated or liquid formulation. Dilute 10 times prior to addition. Active from 10-45°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite and charcoal.

DOSAGE: 1 - 3 g/hL / 1 - 4 ml/hL

SKU: 100 G / 1 KG / 5 KG / 20 KG

CLEAR EXTREME

RAPIDASE

An enzyme for fast, efficient clarification of grape must in difficult and extreme conditions. The use of this enzyme allows for more compact lees and clearer must when settling conditions are difficult, including low temperatures, pH and/or hard to settle varieties.

CLARIFICATION UNDER DIFFICULT CONDITIONS

APPLICATION:
- Pectin and side chain degradation down to 6°C.
- Decreases viscosity.
- Promotes solid particle aggregation.
- Decrease in settling time and turbidity.
- Increase in clear juice percentage.

USAGE: Add as early as possible after pressing. Use the maximum dosage at temperatures below 10°C. Dilute 10 times prior to addition. Active from 10-50°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite and charcoal.

DOSAGE: 1 - 4 g/hL

SKU: 100 G

FLOTATION

Enzyme for fast, efficient flotation of white grape must. The use of this enzyme enables rapid viscosity decrease, allowing for faster migration of solid particles.

GRAPE MUST FLOTATION

APPLICATION:
- Soluble pectin degradation.
- Reduces flotation time.
- Promotes more compact foam by facilitating the accumulation of haze particles.
- Decrease in the percentage lees and turbidity.

USAGE: Add as early as possible after pressing. Use the maximum dosage for must with high pectin content and low maturity at harvest. Dilute 10 times prior to addition. Active from 10-45°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Bentonite or silica gel should only be used as a flotation aid after allowing sufficient time for depectinization.

DOSAGE: 1 - 2 ml/hL

SKU: 5 KG

BATONNAGE

Enzyme for fast, early release of colloids in wines matured on lees.

ENHANCING YEAST AUTOLYSIS TO RELEASE MANNOPROTEINS

APPLICATION:
- Yeast cell wall degradation.
- Enhanced release of mannoproteins and other beneficial colloids like polysaccharides.
- Increases the mouthfeel and balance of the wine.

USAGE: On white wines (3 g/hL) and red wines (5 g/hL) with daily *batonnage* for a minimum of 30 days. Enhanced results can be obtained with an addition of 20 g/hL Extraferm yeast hulls. Dilute 10 times prior to addition. Active from 10-55°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite and charcoal.

DOSAGE: 3 - 5 g/hL

SKU: 100 G

RAPIDASE FILTRATION

Rapidase Filtration is a liquid enzyme formulation with a broad spectrum of hydrolases active on polysaccharides that slow and hinder the filtration of wines. It facilitates filtration by reducing wine clogging power, while safeguarding quality.

FACILITATE AND SPEED UP FILTRATION

APPLICATION:
- This liquid enzyme preparation displays pectolytic actions (specifically polygalacturonase and α-N-arabinofuranosidase) and β-glucanase activity.

USAGE: Add to the must or wine before filtration (with filtering layers, streaming, membrane, tangential filters) and mix well. Suitable for any type of wine: white or rosé; it can also be used on must and during secondary fermentation. At temperatures of 10-15°C, add 5-6 ml/hL for 6-7 days. At temperatures above 15°C, add 3-5 ml/hL for 3-5 days. If the presence of *Botrytis* glucans are confirmed, leave the enzyme in contact for at least two weeks at a temperature higher than 12-13°C. Active from 10-45°C, more active as temperature rises. Active in the wine pH range and in the presence of standard SO_2 concentrations. Can be removed with bentonite.

DOSAGE: 3 - 6 ml/hL

SKU: 1 KG

INOZYME

Inozyme is a lyophilised pectolytic enzymatic preparation with a very broad spectrum of activity, which helps to accelerate the clarification of must and improve the filtration of the wine. To be used for the production of white and rosé wine.

CLARIFICATION AND FILTRATION

APPLICATION:
- For the clarification of juice at low pH (<3.0) and low temperature (<10°C).
- For the clarification of grapes that were mechanically harvested.
- For the clarification of rosé wine produced in the saignée method.

USAGE: Dissolve the contents of 50 g in 1 L of cold water, mix until completely dissolved. Add to must via pumpover and mix thoroughly. Use a drip or metering system to optimise blending within harvested grapes or must. Avoid simultaneous addition of bentonite that will remove the enzyme.

DOSAGE: 1 - 4 g/hL (must) / 1 g/hL (wine)

SKU: 50 G

INOZYME CLEAR

A dual pectolytic and glucanase enzymatic formulation for the clarification and restoration of the aromatic sharpness of white and rosé must from *Botrytis cinerea* spoiled harvests.

CLARIFICATION OF MUST FROM *BOTRYTIS* CONTAMINATED GRAPES

APPLICATION:
- Reduces the grape and *Botrytis* polymers for optimal clarification.
- The pectolytic action accelerates the removal of sediments from the must.
- Results in a decrease in viscosity of the must and making the wine easier to filter.

USAGE: Dissolve the contents of 100 g in 1 L of cold water and stir until completely dissolved. The solution may be used straight away or stored for up to 24 hours at 4°C. Incorporate into the must and then stir or draw off and return until uniformly distributed. Avoid simultaneous addition of bentonite that will remove the enzyme. Treatment will be most effective where temperatures are higher than 17°C. The settling time may vary between 12-16 hours.

DOSAGE: 2 - 4 g/hL / 20 - 40 ml/hL (of prepared solution)

SKU: 100 G

INOZYME TERROIR

Inozyme Terroir is a highly concentrated clarification enzymatic preparation to clarify white and rosé must, as well as juice derived from thermovinification.

CLARIFICATION UNDER DIFFICULT SETTLING CONDITIONS

APPLICATION:
- Clarification of white and rosé must below 10°C.
- Suitable for grape varieties rich in pectins.
- Suited for grapes that were mechanically harvested.
- Suitable for use under accelerated pressing conditions.
- Suitable for use on immature grapes.
- Clarify must from thermovinification.

USAGE: Dissolve the contents of 50 g in 500 mL of cold water and mix until fully dissolved. This solution will remain stable for about 36 hours. Incorporate it as soon as possible: in the receiving hopper, the press or, failing that, add it to the must in the sedimentation tank. If using it with thermovinification, it is best to add the enzymes even before heating the harvested grapes, but the temperature of the grapes should not exceed 60°C. If the temperature is higher, wait for the cooling phase before adding the enzymes. Avoid the simultaneous addition of bentonite that will remove the enzyme.

DOSAGE: 1 - 5 g/hL (must) / 10 - 50 ml/hL (liquid suspension)

SKU: 50 G

EXTRAZYME MPF

Extrazyme MPF is a highly concentrated pectolytic and secondary enzyme preparation intended to compensate for the reduced enzymatic activity caused by lower operating temperatures. It can be used for maceration on the skins with white grapes.

COLD MACERATION

APPLICATION:
- Suitable for maceration at low grape temperatures (<5°C for white).
- Suitable for thick-skinned grapes.
- Rapid clarification after pressing and increased juice output.
- Suitable to reduce the duration of pre-fermentation cold maceration.
- Make subsequent mechanical operations easier.
- The excellent extraction capabilities at low temperatures helps enrich the wine must with thiol precursors.

USAGE: Dissolve the contents of 100 g in 1 L of cold water and mix until fully dissolved. This solution will remain stable for 36 hours. Incorporate it as soon as possible in the receiving hopper. Use a drip or metering system to optimise blending within harvested grapes or must.

DOSAGE: 3 - 6 g/100 kg / 30 - 60 ml/100 kg (liquid suspension)

SKU: 100 G

ENZYMES FOR RED WINE APPLICATION

EXTRA FRUIT

Enzyme for fast, early aroma precursor extraction in red grape maceration. This enzyme allows for the targeted extraction of aroma precursors contained in red grape skins that enhance fruity characteristics.

AROMA PRECURSOR EXTRACTION IN RED WINES

APPLICATION:
- Skin and pulp cell wall degradation.
- Reduces maceration time.
- Increased roundness, raspberry and cherry characteristics.
- Reduced astringency and herbaceous characters.

USAGE: Add as early as possible during maceration. Use the maximum dosage on thick skinned grapes or in pre-ferment cold soaking (8-12°C) conditions. Best results will be obtained when adding an additional 1 g/100 kg two days after the initial dosage. Dilute 10 times prior to addition. Active from 10-50°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite.

DOSAGE: 2 - 4 g/100 kg

SKU: 100 G

EXTRA COLOR

Enzyme for fast, early colour extraction in red grape maceration. This enzyme allows for targeted extraction of colour and polyphenols contained in grape skins and reduces the requirement for more mechanical methods like punch-downs.

COLOUR AND POLYPHENOL EXTRACTION IN QUALITY MACERATION

APPLICATION:
- Grape skin cell wall degradation.
- Increased anthocyanin extraction.

USAGE: Add as early as possible at the crusher or in maceration. Use the maximum dosage for thick skinned grapes or early harvested fruit. Dilute 10 times prior to addition. Active from 10-50°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite.

DOSAGE: 2 - 4 g/100 kg

SKU: 100 G / 1 KG

FAST COLOR

Enzyme for fast colour and polyphenol extraction in short maceration processes. This enzyme has been specifically designed to process wines with a short maceration period. The subsequent processes of draining, pressing and clarification are also facilitated.

FAST COLOUR AND POLYPHENOL EXTRACTION DURING SHORT MACERATION

APPLICATION:
- Degradation of grape skin cell walls.
- Increase in anthocyanin concentration.

USAGE: Add as early as possible at the crusher or in maceration. Use the maximum dosage for grapes harvested early and less than three day maceration period. Active from 10-50°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite.

DOSAGE: 1 - 3 ml/hL

SKU: 5 KG

RAPIDASE FILTRATION

Rapidase Filtration is a liquid enzyme formulation with a broad spectrum of hydrolases active on polysaccharides that slow and hinder the filtration of wines. It facilitates filtration by reducing wine clogging power, while safeguarding quality.

FACILITATE AND SPEED UP FILTRATION

APPLICATION:
- This liquid enzyme preparation displays pectolytic actions (specifically polygalacturonase and α-N-arabinofuranosidase) and β-glucanase activity.

USAGE: Add to the must or wine before filtration (with filtering layers, streaming, membrane, tangential filters) and mix well. Suitable for any type of red wine; it can also be used on must and during secondary fermentation. At temperatures of 10-15°C, add 5-6 ml/hL for 6-7 days. At temperatures above 15°C, add 3-5 ml/hL for 3-5 days. If the presence of Botrytis glucans are confirmed, leave the enzyme in contact for at least two weeks at a temperature higher than 12-13°C. Active from 10-45°C, more active as temperature rises. Active in the wine pH range and in the presence of standard SO_2 concentrations. Can be removed with bentonite.

DOSAGE: 3 - 6 ml/hL

SKU: 1 KG

EXTRAZYME MPF

Extrazyme MPF is a highly concentrated pectolytic and secondary enzyme preparation intended to compensate for the reduced enzymatic activity caused by lower operating temperatures. It can be used for pre-fermentation cold maceration for red grapes.

COLD MACERATION

APPLICATION:
- Suitable for maceration at low grape temperatures (<12°C for red).
- Suitable for thick-skinned grapes.
- Rapid clarification after pressing and increased juice output.
- Suitable to reduce the duration of pre-fermentation cold maceration.
- Make subsequent mechanical operations easier.
- The excellent extraction capabilities at low temperatures helps enrich the wine must with thiol precursors.

USAGE: Dissolve the contents of 100 g in 1 L of cold water and mix until fully dissolved. This solution will remain stable for 36 hours. Incorporate it as soon as possible in the receiving hopper. Use a drip or metering system to optimise blending within harvested grapes or must.

DOSAGE: 3 - 6 g/100 kg / 30 - 60 ml/100 kg (liquid suspension)

SKU: 100 G

EXTRAZYME TERROIR

Extrazyme Terroir is a pectolytic enzyme preparation with highly concentrated secondary capabilities that accelerate the breakdown of the cell walls of the grape berry. Due to the wide activity spectrum, this enzyme is highly suited for preparing high quality red wines and enhancing the potential of poorer quality grapes.

QUALITY MACERATION AND EXTRACTION

APPLICATION:
- Rapid colour stabilisation in high quality grapes.
- Concentrating and expressing the structure through the action of polysaccharides.
- Significant gains in colour and tannins with less qualitative grapes and reducing the mechanical pressing required.
- Improved ratio of free run to press juice.
- Increased overall red wine quality.
- Increased volume and structure, with less astringency.
- Allows for quicker racking off and protection of fruitiness.

USAGE: Dissolve the contents of 100 g in 1 L of cold water and mix until fully dissolved. This solution will remain stable for 36 hours. Incorporate it as soon as possible in the receiving hopper. Use a drip or metering system to optimise blending within harvested grapes or must.

DOSAGE: 3 - 6 g/100 kg / 30 - 60 ml/100 kg (liquid suspension)

SKU: 100 G

RAPIDASE EXTRA PRESS: FOR FAST, EFFICIENT PRESSING OF WHITE GRAPES

RAPIDASE EXTRA PRESS

The pectic polysaccharides of the berry skin cell walls and of the cell layers immediately beneath, serve to maintain the integrity and continuity of the plant tissue. Their molecular structure gives them chemical-physical properties suitable for this purpose, such as water retention capacity and gel formation. All these characteristics are obstacles when white grapes are being processed, in the pre-fermentation extraction and must clarification stages, and for the diffusion of aromatic compounds and their precursors in the must.

Pectins are essentially made up of main chains called homogalacturonans, rhamnogalacturonans, arabinans and arabinogalactans, found particularly in grapes that are considered difficult to process like Muscat. The action of a balanced set of different enzymatic activities is necessary to break down their particularly complex structure.

Rapidase® Extra Press, is an enzymatic preparation suitable for improving the release of juice from white grapes by weakening grape skins. It increases juice yields and allows for softer pressing cycles, thus preserving grape must from oxidation.

In addition to pectolytic activities (pectin lyase, polygalacturonase and pectinmethyl esterase) for must clarification, Rapidase Extra Press contains activities able to hydrolyze both homogalacturonan chains and side chains (arabinans and arabinogalactans). Cellulase and hemicellulase activities are kept at low levels to avoid excessive skin maceration and the formation of an excess of solid particles in suspension that are difficult to remove.

The numerous tests carried out during harvests and on numerous varieties all over the world demonstrate the efficiency of Rapidase Extra Press used in white grape processing, added to the crushed mass in the press or in the prefermentation maceration phase.

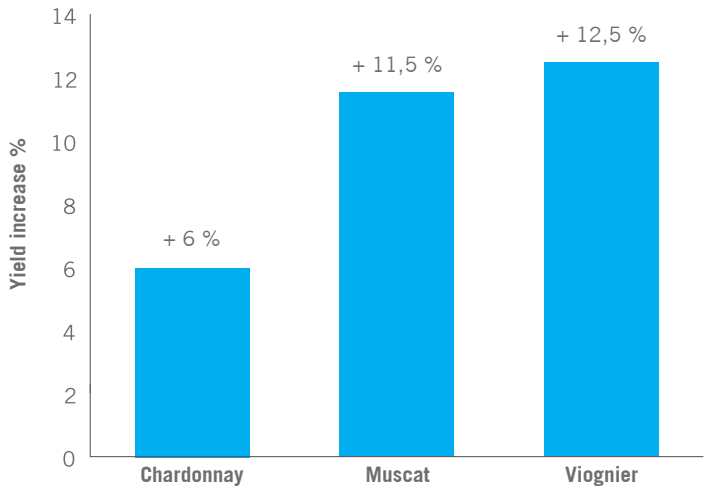


Figure 1. Increase in pressed must yields obtained in tests carried out in France with Rapidase Extra Press compared to the control without enzyme. Results of the trials generated after adding the enzyme directly into the press during the filling. Muscat grapes affected by Oidium. Enzyme dosage: 1 g/100 kg grapes.

RESEARCH RESULTS AND CELLAR TRIALS

A first test conducted at the INRA Pech Rouge experimental centre, France, evaluated the efficiency of Rapidase Extra Press added at 1 g/100 kg to crushed grapes on three different grape varieties (Chardonnay, Muscat and Viognier), on duplicated batches of 65 kg of grapes each (Figure 1) in comparison to an untreated control. Several tests were carried out at industrial scale, comparing the use of Rapidase Extra Press to the enzyme usually used in the same conditions in the winery. The results reported summarise the findings of the tests carried out in France, the USA, South Africa, Chile and Italy.

RAPIDASE EXTRA PRESS IMPROVES YIELDS AND MAXIMISES THE EXTRACTION OF FREE-RUN JUICE

The addition of the enzyme directly in the press, with a contact time of 2–3 hours, or during maceration of 6–10 hours, leads to an increase in yield that increases according to the length of the enzyme action on the skin and the pulp (Figures 2a and 2b). In particular, the greatest increase can be measured in the free-run fraction, obtained from the draining of the crushed grapes treated before pressing cycles start. This not only leads to higher yields, but also to better quality of the must especially due to softer and shorter pressing cycles.

RAPIDASE EXTRA PRESS AND CLARIFICATION

The addition of Rapidase Extra Press to crushed grapes in the press leads to complete degradation of pectins and a reduction in must viscosity. In this way, the enzyme optimizes must extraction and also facilitates its clarification in the following settling or flotation step.

In comparative tests in the various wineries and winegrowing regions, a single addition of Extra Press was sufficient to achieve a good settling, obtain compact lees and clear must compared to the control, without the need of further enzyme additions (Figure 3). In the case of very difficult grapes, an extra addition of 0.5 g/hL of enzyme may be useful in the settling of the last pressing fractions, normally processed separately.

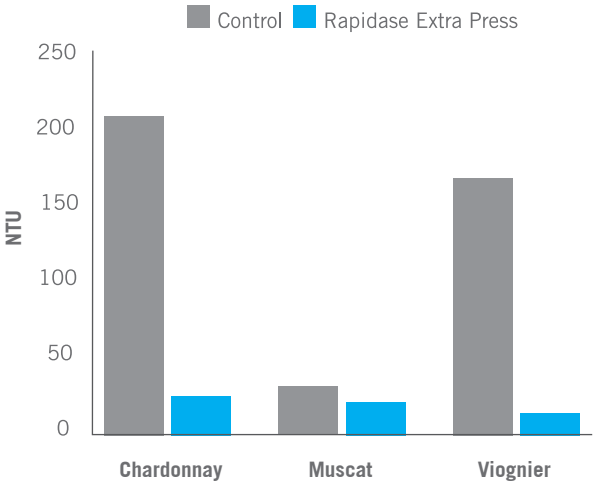


Figure 3.

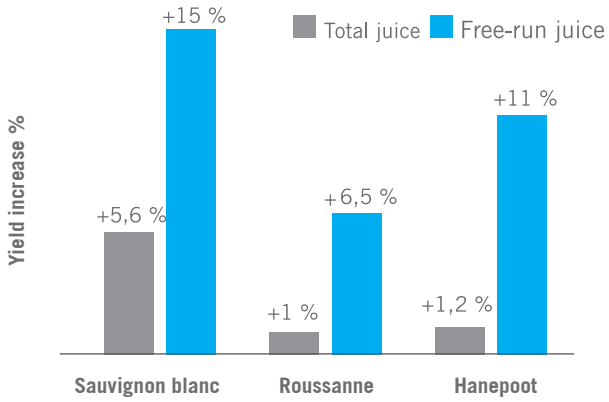


Figure 2a. Increase in yield obtained with Rapidase Extra Press compared to a reference enzyme used in pre-fermentation skin maceration. Sauvignon blanc and Roussanne tested in France (enzyme dosage 1 g/100 kg grapes); Hanepoot tested in South Africa (enzyme dosage 3.3 g/100 kg grapes).

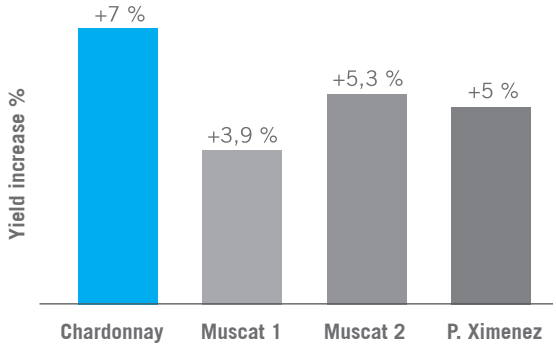


Figure 2b. Increase in total and free-run juice obtained with Rapidase Extra Press compared to a reference enzyme added directly during the filling of the press.

Chardonnay (France, Languedoc); enzyme dosage 1 g/100 kg; maceration 6h at 10°C.

Muscat 1 (USA, California); enzyme dosage 1.1 g/100 kg; maceration at room temperature; free run juice.

Muscat 2 (USA, California); enzyme dosage 1.3 g/100 kg grapes; maceration at room temperature; 7h maceration for Rapidase Extra Press and 12h for competitor enzyme.

Pedro Ximenez Moscato rosado (Chile, Pisco); enzyme dosage 2 g/100 kg grapes; maceration at 16-18°C for 6h; free run juice.

FOR AROMA PRECURSOR EXTRACTION IN WHITE GRAPE MACERATION: RAPIDASE EXPRESSION AROMA

EXPRESSION AROMA

During the 2018 harvest, trials were carried out in partnership with the Fondazione Mach of San Michele all'Adige (Italy). The aim of the trials were to confirm the role of Rapidase Expression Aroma enzyme in raising the aromatic thiol content in wine.

In recent years, this enzyme preparation has been tested several times, mainly in relation to the extraction of terpene and norisoprenoid glycosylated precursors, with ensuing positive results in support of its use. With these trials, the idea was to focus on the content of thiol precursors and consequent thiols in the finished wine.

THE ENZYME

Rapidase Expression Aroma is a granular enzyme with high pectolytic activity targeted to aroma precursor extraction. The enzyme, produced by DSM Food Specialties in the Seclin facility (France), is active at low dosages (1-3 g per 100 kg of grapes), in a short contact-time and from temperatures of 8°C. Normally, Rapidase Expression Aroma needs 2-3 hours to complete extraction.

THE PROTOCOL

An initial mass of 600 kg Sauvignon blanc grapes from Trentino vineyards were divided into two equal batches. The subdivision of the bunches occurred as randomly as possible, bunch by bunch, in order to obtain similar batches.

The enzyme, Rapidase Expression Aroma, was added to one of the treatments, at 3 g/100 kg of destemmed-crushed grapes and then macerated; the other batch was macerated without adding the enzyme.

Maceration lasted 16 hours, at 12°C, under controlled atmosphere (argon). The two batches were then pressed separately to achieve a yield of about 70% (p/p). Accurate measurements of the pressing yields of each batch confirmed the reproducibility of this step. Three samples of each treatment was taken to analyse the classical parameters and thiol precursors.

All the classical parameters (°Brix, sugars, acidity, potassium, pH etc.) were in line with standard analyses. No effect of the enzyme on these parameters were observed.

THIOL COMPOUNDS

Three main varietal thiols and their precursors were monitored in this study, known for their strong impact on the Sauvignon blanc aroma profile. Figure 1 details the structure of these thiol compounds found in wine and their respective corresponding scents and odour thresholds.

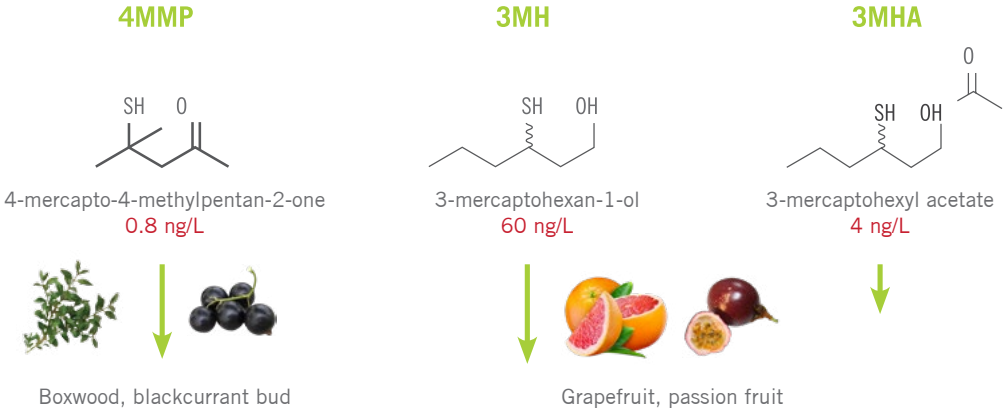


Figure 1. Varietal thiols in wine.

In addition, the main precursors of 3-MH and 4-MMP, were analysed in the different musts: cysteinylated-3MH (Cys-3MH), glutathionylated-3MH (G-3MH), cysteinylated-4MMP (Cys-4MMP) and glutathionylated-4MMP (G-4MMP). G-4MMP was not detected in any of the samples. The concentration of the other precursors are shown in Figure 2.

We observed an effect of the maceration on the thiol precursor levels in must, but the effect of the enzyme is not so evident, except for the destemmed-crushed trials. However, those thiol precursors represent only a part of the total actually present in juice and are not sufficient to explain the thiol levels found at the end of fermentation. Other precursors have been identified in recent years and are not currently routinely analysed, that could be differently affected by the enzyme, depending on their location in the berry.

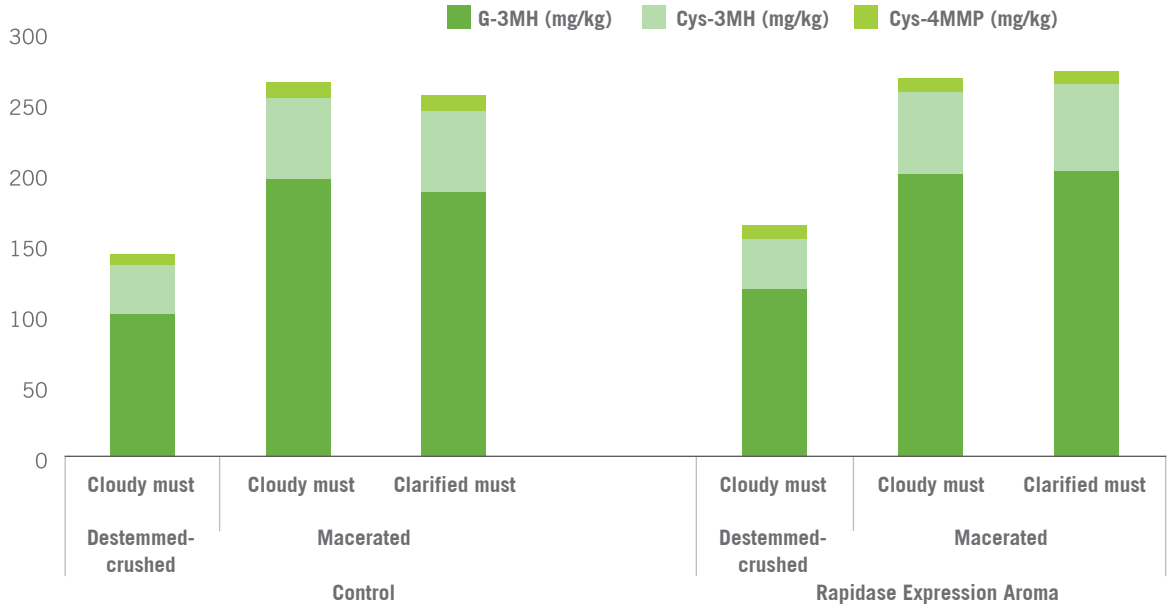


Figure 2. Concentration of the major thiol precursors in musts (mg/kg).

FERMENTATION

After clarification, each triplicate with and without enzyme, was divided into two equal parts. The first one was treated with 30 g/hL of Natuferm Bright, whereas the other received no addition of Natuferm Bright ("no activator"). Alcoholic fermentation was then performed using Fermivin TS28 at 18°C. After fermentation, the wines were sampled for varietal thiol analysis. The results for 3MH are shown in Figure 3.

Contrary to the thiol precursors, the advantage is clear in samples that have undergone maceration using Rapidase Expression Aroma. The percentage increase in the 3MH content was 24% for the enzyme-enriched sample in the absence of an activator, and 17% in the presence of Natuferm Bright.

Furthermore, evidence clearly shows the synergistic effect of adding enzyme and activator, which makes it possible to obtain 51% more 3MH with respect to the control sample (Figure 3).

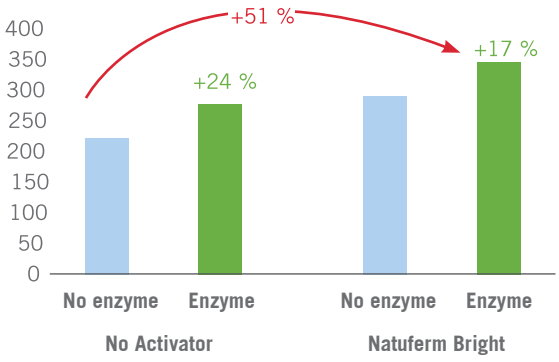


Figure 3. Concentration 3MH at the end of fermentation. Mean values of three replicates for each sample.

CONCLUSION

This work is the first step towards examining the impact of pre-fermentation maceration using a specific enzyme such as Rapidase Expression Aroma on the thiol precursors and volatile thiol levels.

The results were very encouraging in favour of the practice. Rapidase Expression Aroma is clearly efficient for increasing thiol levels in wine. We therefore recommend its use on grapes rich in aromatic precursors, to maximise the quality potential of the grapes and ensure greater complexity and varietal expression in the wine. In addition, this study showed the great advantage of in integrated approach, combining enzyme, yeast and yeast nutrition to better the thiol potential of the grape.

NOTES

CHAPTER 6: TANNINS

INTRODUCTION

There are three classes of flavonoids found in grapes and wine: anthocyanins, flavonols and tannins. Tannins include a range of polyphenolic compounds and add bitterness and astringency, body and mouthfeel and influences colour stability by forming polymeric complexes with anthocyanins. There are two types of tannins: hydrolysable (usually found in commercial tannin products) and condensed tannins that are grape derived. Grape-derived tannins see their main synthesis happening in the seeds immediately after fruitset and reaching a maximum concentration at *veraison*.

Tannins play a vital role in the quality and stability of wines. There are various winemaking processes that will influence the natural tannin concentration in the must and wine. As a supplementary or complementary source, the interest in the addition of commercial tannins have significantly increased due to their ability to react with a large variety of different compounds. When tannin additions are deemed necessary, possible commercial tannin sources include amongst others: oak, chestnut, grape, exotic woods and gall nuts. Ellagic tannins refer to those tannins from an oak/chestnut source, whereas proanthocyanidins refer to tannins sourced from grape (skin or seed) or exotic woods.

Tannins are generally added during three main stages of wine production: fermentation, ageing/cellaring and before bottling (finishing/conservation; up to 48 hours before bottling). The timing of the tannin addition, the composition of the specific product and the individual must/wine matrix will influence the impact that the tannin(s) will have in the wine.

ANTI-OXIDANT ACTION

Tannins have anti-oxidant properties and can stop oxidation reactions that occur due to the production of free radicals. Thus, acting in synergy with SO_2 and/or ascorbic acid, tannins offer more control over the redox parameters of the must during fining.

COLOUR STABILISATION

Condensed tannins can form stable complexes through their interaction with wine anthocyanins (co-pigmentation). The ellagic tannins have an anti-laccase action which prevents the browning of the wine. All these interactions contribute to stabilising the wine colour during ageing.

MOUTHFEEL AND STRUCTURE

Through their interaction with the saliva proteins, wine tannins are responsible for astringency during tasting. A moderated and delicate astringency contributes to creating an impression of structure, as well as volume and mouthfeel persistence. In addition, the formation of complexes between tannins and polysaccharides convey a smooth and generous mouthfeel sensation. Tannins will thus help your wine to evolve towards more volume and roundness.

FINING

Young wines may be subject to unstable colour, green sensations and taste astringent, or even bitter. Those defaults can be lessened during the fining process, during which tannins contribute as an adjuvant by combining with wine proteins. They contribute to the clarification and stabilisation of the wine and can also treat the effect of overfining.

AROMATIC IMPACT AND EFFECT ON SULPHUR COMPOUNDS

Some sulphur compounds convey unpleasant aromas. In red wines, tannins combine with those substances and reduce their negative impact. Alternatively, tannins sourced from specific wood varieties (e.g. red fruit tree varieties) can enhance the sensory characters of the wine.

TANNIN SELECTION

	Tanin Bouquet R36	Tanin SR	Tanin SR Terroir	Essential Free Veg	Essential Oak Barrel	Essential Oak Strong	Essential Oak Sweet
Composition	**A blend of condensed tannins extracted from the wood of red berry fruit species**	**Extract of concentrated catechin tannins**	**A combination of catechin tannins reinforced with grape seed tannins**	**Tannins exctracted from exotic wood species**	**Blend of ellagic tannins extracted from French oak**	**Blend of ellagic tannins extracted from French oak**	**A blend of ellagic tannins extracted from various oak sources**
Application	Fermentation	Maceration and fermentation	Fermentation and ageing	Ageing	Finishing	Finishing	Finishing
White		■		■	■	■	■
Rosé	■			■	■	■	■
Red	■	■	■	■	■	■	■
Stabilise colour	■	■	■				
Stabilise aroma	■	■	■				
Protect from oxidation	■		■	■			
Prevent or cure reductive aroma	■		■				
Clarification during riddling	■		■				
Increase balance	■		■			■	■
Enhance structure and body		■	■			■	
Enhance roundness or fullness		■			■		
Enhance fruit character	■				■		
Mask vegetal characters				■			
Reduce astringency				■			
Increase varietal character				■			
Perception of sweetness or softness							■
Lower alcohol perception					■		
Can be added 48h before bottling					■	■	■

	Essential Passion	Essential PEL	Essential PEP	Privilège Bleu	Privilège Noir	Tanifase Elevage	Solution ST
Composition	**Condensed tannins extracted from red fruit trees**	**Preparation based on white grape skins**	**Preparation of condensed tannins extracted from grape seeds**	**A blend of ellagic tannins extracted from American oak**	**A blend of ellagic tannins extracted from French oak**	**Hydrolysable tannin from oak**	**A liquid preparation of tara tannins and copper sulphate**
Application	Ageing and finishing	Fermentation, ageing and finishing	Fermentation, ageing and finishing	Finishing	Finishing	Ageing and finishing	Clarification during riddling
White		■		■			■
Rosé	■	■	■	■	■		■
Red	■	■	■	■	■	■	
Stabilise colour			■			■	
Stabilise aroma	■	■				■	
Protect from oxidation	■	■		■	■		■
Prevent or cure reductive aroma							■
Clarification during riddling							■
Increase balance		■			■	■	
Enhance structure and body		■	■	■	■		
Enhance roundness or fullness			■				
Enhance fruit character	■	■	■		■		
Enhance aromatic intensity				■			
Enhance ageing potential							■
Perception of sweetness or softness		■					
Can be added 48h before bottling		■	■	■	■		

PRODUCT CATALOGUE

FERMENTATION TANNINS

TANIN BOUQUET R36

A blend of condensed tannins extracted from the wood of red berry fruit species. A tannin for the fermentation of young and medium aged red wines and rosé. This product increases the red berry fruit taste, with a strong action in stabilising the colour.

ENHANCE RED BERRY FRUIT AROMA

APPLICATION:

- Increases the concentration of glycosylated aroma precursors.
- Intense aromas of cherry, strawberry and blueberry that complement varietal and fermentation aromas.
- Promotes colour stabilisation.
- Prevents oxidation of primary aromas.

USAGE: Fermentation tannin to be added during alcoholic fermentation. Dissolve in 10 times the amount of water or must and add during processing. Add Tannin Bouquet R36 within 48 hours of yeast inoculation.

DOSAGE: 2 - 15 g/hL (rosé wine) / 5 - 20 g/hL (red wine)

SKU: 1 KG

TANIN SR

Tanin SR is an extract of concentrated catechin tannins with a tannic acid content greater than 70% to be used during fermentation.

IMPROVE COLOUR, STRUCTURE AND ROUNDNESS

APPLICATION:

- Stabilise colour and improve structure during the maceration of red wines.
- Imparts roundness in white wines.

USAGE: Dissolve in a small volume of warm water whilst stirring to avoid lumps. Add Tanin SR during a pumpover and mix well.

DOSAGE: 15 - 30 g/100 kg (maceration) / 15 - 30 g/hL (vinification)

SKU: 1 KG / 5 KG / 15 KG

TANIN SR TERROIR

Tanin SR Terroir is a combination of catechin tannins reinforced with grape seed tannins.

STABILISE COLOUR AND ANTI-OXIDANT

APPLICATION:

- Stabilise colour and reinforce the anti-oxidative properties of SO_2 during the maceration of red wine.
- Improve structure and help colour stability when used post-fermentation.
- Revive 'tired' wines after prolonged storage.

USAGE: Dissolve in a small volume of warm water whilst stirring to avoid lumps.

DOSAGE: 5 - 15 g/hL (maceration and vinification) / 5 - 30 g/hL (ageing)

SKU: 1 KG

AGEING AND FINISHING TANNINS

ESSENTIAL FREE VEG

Essential Free Veg is a condensed tannin extracted from exotic species of tree that can be used to fine white, red and rosé wines. It provides a strong anti-oxidant action and helps to mask vegetative notes.

REDUCE HERBACEOUS CHARACTERS

APPLICATION:
- Masks vegetative aromas.
- Masks astringent sensations.
- Enhance varietal character.

USAGE: Dissolve the product in 10 times the amount of water, must or wine and add during a pumpover.

DOSAGE: 5 - 10 g/hL (white and rosé) / 10 - 20 g/hL (red)

SKU: 500 G

ESSENTIAL OAK BARREL

Essential Oak Barrel is a blend of ellagic tannins extracted from the heart of French oak trees (*Quercus robur*) that can improve the wine by fining and before bottling (48h).

IMPROVED FULLNESS

APPLICATION:
- Improved sweetness and aromatic intensity.
- Improve the fullness of the wine.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover. Add Essential Oak Barrel to the wine at the fining stage or at the pre-bottling stage, at least 48 hours before the final microfiltration. Lengthen this duration to one week in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 10 g/hL

SKU: 500 G

ESSENTIAL OAK STRONG

Essential Oak Strong is elaborated with a blend of ellagic tannins extracted from French oak trees (*Quercus robur*) and can be used at the pre-bottling stage (48h).

STRUCTURE

APPLICATION:
- Reinforce wine structure.
- Optimise general balance.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover. Add Essential Oak Strong to the wine at the pre-bottling stage, at least 48 hours before the final microfiltration. Lengthen this duration to one week in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 10 g/hL

SKU: 250 G

ESSENTIAL OAK SWEET

Essential Oak Sweet is elaborated with a blend of ellagic tannins extracted from oak trees from various origins and can be used at the pre-bottling stage (48h).

SOFTNESS AND SWEETNESS

APPLICATION:
- Increased softness and sweetness.
- Increased balance in barrel-aged wines.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover. Add Essential Oak Sweet to the wine at the pre-bottling stage, at least 48 hours before the final microfiltration. Lengthen this duration to one week in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 15 g/hL

SKU: 500 G

ESSENTIAL PASSION

Essential Passion is elaborated with condensed tannins extracted from red fruit trees and can be added to red and rosé wines at the fining stage or within 10 days before bottling.

ENHANCED FRUITINESS

APPLICATION:
- Enhance fruity aromas.
- Increase the delicacy of the wine.
- Increase the aromatic intensity.
- Anti-oxidative properties.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover. Add Essential Passion to the wine at the fining stage, or within 10 days before bottling. Lengthen this duration to two weeks in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 15 g/hL

SKU: 500 G

ESSENTIAL PEL

A tannin preparation based on white grape skins with significant anti-oxidative properties that can be added during the alcoholic fermentation, fining or pre-bottling stages (48h). Essential PEL is perfect for improving the quality of wines by increasing their softness and aromatic intensity.

STRUCTURE AND FRESHNESS

APPLICATION:
- Increase anti-oxidant protection and ensure long-lasting freshness (fermentation and racking).
- Increase levels of anti-oxidant protection and freshness of the aroma (pre-bottling).
- Improving the structure and flavour balance (pre-bottling).

USAGE: Dissolve the product in 10 times the amount of water, must or wine and add while stirring. At the pre-bottling stage, add Essential PEL at least 48 hours before the final microfiltration.

DOSAGE: 2 - 20 g/hL (must) / 1 - 20 g/hL (white, red and rosé wine)

SKU: 500 G

ESSENTIAL PEP

Essential PEP is a preparation made from condensed tannins extracted from grape seeds that provide notable anti-oxidant properties that can be added during the alcoholic fermentation, fining or pre-bottling stages (48h). Its high reactivity makes Essential PEP ideal for preventing various forms of oxidation.

STABILISE COLOUR AND ADD STRUCTURE

APPLICATION:
- Increase colour stabilisation in red and rosé wines during fermentation.
- Improves the body and aromatic complexity of the wine when added during fining and pre-bottling stages.
- Increased structure in red wines.
- Improved qualitative characteristics when added during the fining process.
- Protection against oxidation when used before final racking and the end of barrel storage.

USAGE: Dissolve the product in 10 times the amount of water, must or wine and add while stirring. At the pre-bottling stage, add Essential PEP at least 48 hours before the final microfiltration.

DOSAGE: 1 - 20 g/hL (red and rosé must) / 1 - 20 g/hL (white, red and rosé wine)

SKU: 500 G

PRIVILÈGE BLEU

Privilège Bleu is a blend of ellagic tannins originating from American oak trees (*Quercus alba*) and can be used in white, red and rosé wines during the ageing period or at the pre-bottling stage (48h).

BODY AND AROMATIC INTENSITY

APPLICATION:
- Anti-oxidant.
- Contributes to the structure and body.
- Strengthen aromatic intensity.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover/mixing. At the pre-bottling stage, add Privilège Bleu at least 48 hours before the final microfiltration. Lengthen this duration to one week in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 15 g/hL

SKU: 250 G

PRIVILÈGE NOIR

Privilège Noir is a blend of ellagic tannins originating from French oak trees (*Quercus robur*) and can be used in red and rosé wines during the ageing period or at the pre-bottling stage (48h).

RED AND RIPE FRUIT NOTES

APPLICATION:
- Anti-oxidant.
- Contributes to the structure.
- Emphasise red and ripe fruit aromas.
- Increase balance.

USAGE: Dissolve the tannin in 10 times its volume of hot water (35°C) and add to the wine during a pumpover/mixing. At the pre-bottling stage, add Privilège Noir at least 48 hours before the final microfiltration. Lengthen this duration to one week in case of full-bodied wines rich in polyphenols.

DOSAGE: 1 - 10 g/hL

SKU: 250 G

TANIFASE ELEVAGE

Tanifase Elevage is a hydrolysable tannin extracted from oak (*Quercus robur* and *petraea*) staves to increase the balance in red wines.

INCREASE BALANCE

APPLICATION:
- Stabilise colour.
- Stabilise aroma.
- Increased balance.

USAGE: Dissolve Tanifase Elevage (200 g/L) in hot water (40-45°C) under vigorous stirring. Mix well in wine. It is recommended to add Tanifase Elevage after malolactic fermentation and a few weeks before bottling. One or two aerations are recommended for better revelation of the aroma. Filter after a few days of treatment.

DOSAGE: 5 - 15 g/hL

SKU: 1 KG

SOLUTION ST

Solution ST is a liquid preparation comprising of Tara tannins and copper sulphate.

PRESERVATION DURING RIDDLING

APPLICATION:
- Prevents oxidation.
- Acts as preventative and curative treatment for reductive odours.
- Assists clarification during riddling.
- Reinforces the ageing potential of the wine.

USAGE: Add directly to the wine at the same time as riddling agents. Ensure thorough mixing.

DOSAGE: 20 - 40 ml/hL

SKU: 1 L / 10 L

NOTES

CHAPTER 7: MANNOPROTEINS

INTRODUCTION

Mannoproteins are a naturally occurring group of proteins found in the cell walls of yeast, including that of *Saccharomyces cerevisiae.* The *S. cerevisiae* cell wall mainly consists of polysaccharides (glucans and mannans), but also contains proteins, particularly mannoproteins. Mannoproteins are large molecules, with molecular weights as high as 800 000 Daltons. They can have very diverse structures, which results in a diversity of properties and are highly soluble in aqueous media.

Mannoproteins consist of a polypeptide (protein) backbone chain, with highly branched mannose (naturally occurring sugar similar to glucose in structure) side chains that are linked by glycosidic bonds. The mannose chains can attach to the protein component via amide bonds to produce extensively branched N-linked glycans. Alternatively, the mannose chains can bond to the protein component via ether bonds, producing linear O-linked glycans. Mannoproteins usually consist of approximately 20% protein and 80% mannose.

Mannoproteins are released during fermentation and then later during autolysis. Different fractions of mannoproteins are released depending on the timing: mannoproteins of exocellular origin are released during fermentation, whilst cellular ones are released upon autolysis (end of alcoholic fermentation). The amounts that are released depend on: the yeast strain, degree of must clarification and post-fermentation storage conditions.

It is possible to increase the mannoprotein content in wine via: ageing on lees, the use of enzymes, use of yeast hulls and the addition of commercial mannoprotein preparations.

Mannoproteins can influence:

- Protein and tartrate stability
- Mouthfeel (volume, bitterness and herbaceousness)
- Sweetness and roundness
- Polyphenols
- Complexity
- Aromatic persistence
- Colour
- Foam stability

The production process of commercial mannoproteins involves various steps of heat and/or acid treatments and filtrations and ultra-filtrations. It is possible to obtain different fractions of mannoproteins by using different yeast strains as source material, different types of extraction methods and different conditions of ultra-filtration.

The protective colloid role played by mannoproteins is influenced by the mannose chain: it prevents the aggregation and precipitation of potassium bitartrate crystals and reacts with polyphenols avoiding oxidation. The impact of mannoproteins on the sensory properties of the wine is influenced by the peptide backbone: the higher the protein fraction, the more interactive the mannoprotein is with aroma compounds.

Commercial mannoproteins can be used to supplement the naturally occurring mannoprotein fractions present in wine and enhance their positive effect.

MANNOPROTEIN SELECTION

	Final touch Pop	Final touch Tonic	Final touch Gusto	Ultima Fresh	Ultima Soft
Liquid	■	■	■		
Granulated				■	■
White wine		■			■
Rosé wine		■			■
Red wine			■	■	
Sparkling and MCC wines	■				
Enhanced mouthfeel and roundness	■	■	■		
Stabilise aroma		■			
Enhance aroma			■		■
Enhance fineness and freshness			■	■	
Reduce astringency			■		
Enhance bubble finesse	■				
Enhance sweetness				■	■
Lees alternative				■	■
Decrease bitterness				■	
Reduce acidity perception					■

PRODUCT CATALOGUE

FINAL TOUCH POP

This is a unique mannoprotein-based solution that enhances the organoleptic qualities of sparkling wines, while also preserving their elegance, freshness and balance. The fermentation aromas and minerality of wines treated with Final touch Pop remain predominant during ageing and storage. The development of oxidative aromas (hints of ripe fruit, nuts and honey) is attenuated and tannins are less astringent.

IMPROVE THE QUALITY OF SPARKLING WINES

APPLICATION:
- Improves the wine's structure and bubble quality.
- Provides a refined aromatic profile and persistence.
- Aids in elegance, freshness and balance.
- Provides smooth and round mouthfeel.
- Limits oxidation to increase longevity.
- Reduces astringency of rosé and tannic sparkling wines.
- Can also refresh base wines.
- To be added directly to the liqueur at disgorgement or before bottling for Charmat methods.

USAGE: Final touch Pop is completely soluble and can be added directly to the wine. Add homogenously to sparkling wines after the second fermentation, immediately before bottling (Charmat method), or to the dosage or liqueur added after disgorging (traditional method).

DOSAGE: 20 - 40 ml/hL

SKU: 1 L

FINAL TOUCH TONIC

This specially selected solution contains mannoproteins selected for their powerful reducing and protective colloid properties. Final touch Tonic preserves the initial aromatic freshness of white and rosé wines as they age.

ENHANCE QUALITY AND PREVENT PREMATURE AGEING

APPLICATION:
- Improves & preserves the freshness.
- Protects from oxidation over time.
- Promotes aromatic expression and persistence.
- Contributes to the wine's colloidal balance helping to improve its structure.
- Adds to the continuity of the wine, a lower perception of acidity and more balance overall.

USAGE: Final touch Tonic is completely soluble and can be added directly to the wine. Add homogenously to white and rosé wines just before bottling.

DOSAGE: 20 - 40 ml/hL

SKU: 1 L

FINAL TOUCH GUSTO

When used in red wines, this mannoprotein noticeably enhances the aroma intensity, fineness and freshness, as well as reducing the astringency of tannins.

ENHANCING THE ORGANOLEPTIC AND SENSORY PROPERTIES OF RED WINES

APPLICATION:
- Improves the aromatic intensity.
- Promotes freshness and fruitiness.
- Reduces astringency, more significantly at lower dosages.
- Contributes to a rounder wine structure.

USAGE: Final touch Gusto is completely soluble and can be added directly to the wine. Add homogenously to red wines just before final filtration and bottling.

DOSAGE: 10 - 40 ml/hL

SKU: 1 L

ULTIMA FRESH

Ultima Fresh is a micro-granulated preparation of selected mannoproteins that act as a lees alternative.

FRESHNESS, SWEETNESS AND LENGTH IN THE MOUTHFEEL

APPLICATION:
- Restore the wine's freshness.
- Re-balance the structure of wine with lower phenolic maturity.
- Increase the length in the mouth, roundness and sweetness.
- Decrease bitterness and spicyness, whilst increasing freshness in the mouth.
- Harmonise the balance of alcohol, tannins, acidity and sweetness.

USAGE: Dissolve Ultima Fresh in 10 times its own volume of water or wine. After addition, thoroughly blend the wine by pumping over or stirring up the lees (batonnage), taking care not to introduce oxygen. If the wine is going to be filtered, add Ultima Fresh 24 hours before filtration; it will not decrease the filterability.

DOSAGE: 5 - 25 g/hL

SKU: 500 G

ULTIMA SOFT

Ultima Soft is a micro-granulated preparation of selected mannoproteins that act as a lees alternative.

ROUNDNESS AND AROMATIC PERSISTENCE

APPLICATION:

- Reduces the perception of excessive acidity.
- Improve wine colloidal balance.
- Shifts the acidity/dryness balance towards roundness, sweetness and aromatic persistence.
- Enhances the perception of saltiness.

USAGE: Dissolve Ultima Soft in 10 times its own volume of water or wine. After addition, thoroughly blend the wine by pumping over or stirring up the lees (batonnage), taking care not to introduce oxygen. Ultima Soft can be added to the wine before filtration.

DOSAGE: 5 - 25 g/hL

SKU: 500 G

CHAPTER 8: STABILISATION

INTRODUCTION

Supersaturation is the chemical condition where a solution contains more of a dissolved material that can actually be dissolved under normal circumstances. The supersaturation of wines with tartaric acid is well documented, characterised by the spontaneous crystallisation of potassium hydrogen tartrate (KHT). Should crystallisation occur after bottling, a deposit of crystals become clearly visible – a phenomenon that is perceived negatively by most consumers and thus also winemakers. A delay in the formation of these crystals is partly caused by wine colloids such as proteins, polysaccharides and polyphenols. On the other hand, the duration of delay depends on the respective concentrations and molecular structure of the aforementioned colloids, as well as wine pH and concentration of tartaric acid, potassium and other cations. Another important consideration is the temperature during wine storage.

The important role of colloids during winemaking is evident when it is observed that wine aged on lees and stirred at regular intervals has a higher resistance against spontaneous crystallisation of KHT. This can be attributed to the mannoproteins (MP) released from yeast cell walls. While lees stirring is not specifically applied to aid tartrate stability, cold stabilisation is performed to overcome the unpredictable crystallisation of KHT.

Cold stabilisation is done by simultaneously cooling wine down to -4°C and seeding it with KHT crystals, after which the wine is kept at this temperature for several days. This process has several downsides that are detrimental to wine quality, including oxidation and subsequent loss of wine aroma, some loss of unstable hydrocolloids, as well as pH and acid composition changes. The need for a specific vat-room and the substantial amount of cooling energy required are additional concerns. Another method that also reduces tartaric acid and potassium concentrations in wine is electrodialysis. Possible barriers to using this technique include the substantial financial investment required and water input, making it more suitable for larger wineries.

A third approach aimed at the addition of stabilising substances to wine, rather than the deletion or supersaturation as described above, can also inhibit crystallisation. KHT crystallisation can be effectively remedied with stabilisers such as metatartaric acid (MT), carboxymethylcellulose (CMC) and *Saccharomyces cerevisiae* derived mannoproteins (MP). It has been debated whether MP and other colloidal substances prevent nucleation, or if they influence the growth of crystals, while other authors mention the inhibition of both nucleation and crystal growth.

PRODUCT SELECTION

	Claristar
Liquid	■
Granulated	
White wine	■
Rosé wine	■
Red wine	■
Sparkling and MCC wines	
Enhanced mouthfeel and roundness	■
Stabilise aroma	■

CLARISTAR

Claristar inhibits the nucleation and growth of potassium tartrate crystals, enabling lasting stabilisation in white, rosé and red wines. Claristar also contributes to the sensorial quality of the wine.

TARTRATE STABILISATION AND IMPROVEMENT OF WINE QUALITY

APPLICATION:

- Tartrate stabilisation.
- Preservation of natural acidity.
- Increased aroma expression.
- Sensation of volume and roundness on the palate.
- Improved aromatic freshness during wine storage.

USAGE: Claristar is easy to homogenise and can be added directly to the wine. Addition to be done as close as possible to final filtration and bottling. Protein stabilisation and final blending must be completed before the addition of Claristar. The final stages of filtration and bottling can be carried out immediately after the addition of Claristar. It is recommended to use Claristar after filters using diatomaceous earth. Claristar can be filtered through membranes, filtering plates, tangential filters and lenticular models.

DOSAGE: 50 - 120 ml/hL (subject to analysis: contact your technical sales manager directly)

SKU: 2.5 L

CHAPTER 9:
SUPLHUR PRODUCTS

INTRODUCTION

Wine quality can be preserved with sulphur dioxide. Sulphur dioxide is used in wine for its anti-oxidant and anti-microbial properties. The effectiveness of sulphur dioxide as an antimicrobial agent is dependent upon the pH, as well as the presence of other SO_2 binding compounds. As the pH increases, the portion of sulphur dioxide that is active against microorganisms decrease. Therefore, an increase in the pH requires the addition of more sulphur dioxide to maintain adequate antimicrobial activity.

There are three common forms of sulphur in wine: sulphur, sulphides and sulphites.

- Sulphur (S): elemental sulphur is present in proteins and used on grapes to prevent rot
- Sulphides (H_2S and mercaptans): rotten egg smell produced by yeast and bacteria (reduced sulphur)
- Sulphites (SO_2 and all its forms): oxidised sulphur

There are also three forms of sulphite: molecular sulphur dioxide (SO_2), bisulphite ion (HSO_3^-) and sulphite ion (SO_3^{2-}). These three forms can be bound (bound sulphur) to various compounds such as phenols, acetaldehyde and sugar, whilst the free forms exist in an equilibrium that is highly pH dependent (bound plus free equals total SO_2):

$$H_2O + SO_2 \leftrightarrow H^+ + HSO_3^- \leftrightarrow 2H^+ + SO_3^{2-}$$

ANTI-OXIDANT ACTION OF SO_2:

- Prevents enzymatic degradation by inhibiting the enzyme polyphenol oxidase and slows down oxidation.
- Mechanism: denaturation of the enzyme so it loses functionality.
- It combines with products of wine oxidation, such as acetaldehyde, quinones and peroxide which limits their damaging impacts in wine.

ANTI-MICROBIAL ACTION OF SO_2:

- Effective against bacteria and non-*Saccharomyces* (*Saccharomyces* species are generally more tolerant).
- The yeast cell membrane allows molecular SO_2 to enter the cell. The higher internal pH causes dissociation and the resultant sulphites bind with proteins and enzymes to eventually kill the cell. Ions cannot enter the cell, hence only the molecular SO_2 generally present in smaller quantities, play an anti-microbial role. Since a lower pH results in more SO_2 present in the molecular fraction, pH management is key.

CALCULATING THE ADDITION OF POTASSIUM METABISULPHITE (PMBS)

Potassium metabisulphite is a white crystalline salt containing 57.6% sulphur dioxide.

ADJUSTING THE TOTAL SO_2 (TSO_2)

SO_2 addition (mg/L) = Desired TSO_2 (mg/L) - Current TSO_2 (mg/L)

$$PMBS\ (g) = \frac{(volume\ of\ wine\ in\ L)\ x\ (sulphur\ dioxide\ addition\ in\ mg/L)}{0.576} \div 1000$$

ADJUSTING THE FREE SO_2 (FSO_2)

Not all the added SO_2 will be present in the free form and the formula to calculate the adjustment of the free SO_2 has to be adjusted to compensate for the percentage that will be bound. This conversion factor will be higher the more unsanitary the grapes are.

The estimated percentage of free SO_2 that will be bound after addition and the conversion factor (CF) to use in the calculation:

Estimated % of free sulphur dioxide that is converted to the bound form	Conversion factor (CF)
10	1.1
20	1.2
30	1.3
40	1.4
50	1.5
60	1.6
70	1.7
80	1.8
90	1.9
100	2.0
110	2.1
120	2.2
130	2.3
140	2.4

SO_2 addition (mg/L) = Desired FSO_2 (mg/L) - Current FSO_2 (mg/L)

$$PMBS\ (g) = \frac{(volume\ of\ wine\ in\ L)\ x\ (sulphur\ dioxide\ addition\ in\ mg/L)}{0.576} \times CF \div 1000$$

PRODUCT SELECTION

	Sulfitanin Liquid	Inodose 5	Potassium metabisulphite
White and rosé wine			
Red wine			
Application	At pressing	Barrel ageing	Grapes, must, fermentation and ageing
Anti-microbial			
Anti-oxidant			
Increased solubility of polyphenols			
Available SO_2	100 g/L	5 g	57.6%

PRODUCT CATALOGUE

SULFITANIN LIQUID

Sulfitanin Liquid is a solution of ammonium bisulphate and tannin at 100 g/L of pure SO_2 and is used to adjust sulphur dioxide levels in must. In the must tank for white wine production, Sulfitanin Liquid prevents oxidation and microbiological alterations. For red wines in the maceration tank, red colour is extracted and stabilised with the use of the product.

SULPHUR ADJUSTMENT

APPLICATION:
- Antiseptic action prevents the growth of indigenous undesirable yeast and bacteria.
- Prevents oxidation.
- Helps to extract colour.
- Tannins reinforce the anti-oxidant mechanism of SO_2 and gives better structure and ageing ability, without increasing the astringency in white wines.
- Stabilise the colour in red wines.

USAGE: The addition of Sulfitanin Liquid must be followed by good homogenisation in the must. Avoid any contact between Sulfitanin Liquid and metallic objects.

DOSAGE: 50 - 80 ml/hL (white and rosé) / 50 - 100 ml/hL (red during maceration)

SKU: 5 L / 10 L

INODOSE 5

Inodose 5 contains potassium metabisulphite that releases sulphur dioxide when added to must or wine.

SULPHUR ADJUSTMENT IN BARRELS

APPLICATION:
- For adjusting the sulphur in wines being aged in barrel.
- Useful when low dosages of sulphur dioxide is required.

USAGE: Adapt the number of tablets to the quantity of desired SO_2 and the volume of wine to be treated. E.g. 10 hL to be adjusted by 1 g/hL, requires two tablets.

DOSAGE: One tablet of Inodose 5 releases 5 g of SO_2.

SKU: 42 TABLETS

POTASSIUM METABISULPHITE

Potassium metabisulphite can be used to adjust sulphur levels throughout the winemaking process, from press to finished wine.

SULPHUR ADJUSTMENT

APPLICATION:
- Antiseptic against yeast and bacteria.
- Anti-oxidant activity.
- Increases solubility of polyphenols.

USAGE: The product is easier to use if previously dissolved in a wine/water mixture (40% weight by volume). E.g. 400 g of Potassium metabisulphite in 1 L of water provides 200 g of sulphur dioxide in solution.

DOSAGE: dependent on existing sulphur levels

SKU: 1 KG

CHAPTER 10:
YEAST BIOPRODUCTS

INTRODUCTION

Bioproducts are materials, chemicals and energy derived from renewable biological sources. One such an example of a yeast bioproduct is inactivated yeast. During the production process of inactivated yeast, the whole cell has been killed via a heat treatment. It contains the cell wall, cell membrane and whole inside (cytoplasma) of the yeast cell.

GLUTATHIONE (L-ɣ-glutamyl-L-cysteine-L-glycine)

- is a tripeptide;
- contains three amino acids: glutamate, cysteine and glycine;
- most abundant non-protein sulphur compound in most living organisms;
- naturally present in grapes/must.

In must and wine, glutathione is present in the reduced form (GSH) or the oxidised form (GSSH) (two glutathione molecules linked with a sulphide bridge). The natural GSH concentration in must is dependent on the grape variety, viticultural practices and winemaking practices. Only the reduced GSH form has highly effective anti-oxidant properties that can positively influence wine aroma, longevity and quality.

ANTI-OXIDATIVE MECHANISM

- Caftaric acid is one of the main phenols in must that is most susceptible to oxidation.
- GSH can react with caftaric acid via its -SH group.
- This reaction forms the Grape Reaction Product (GRP).
- This GRP is stable and colourless.

Due to the fact the GSH naturally present in the wine is highly sensitive to oxidation, research has shown that it is beneficial to supplement the must with additional glutathione. Whilst the use of pure glutathione in wine production is not approved, glutathione-rich inactivated yeast is approved for use. Although inactivated yeasts are intact cells, their cell membranes that are responsible for regulating the flow of molecules in and out of the cell, are damaged due to the inactivation process. Small molecules like vitamins, minerals, amino acids and GSH, can leak out and have an impact on the wine. The glutathione therefore accumulated intracellularly during the production process of the inactivated yeast is then released in the must.

Factors influencing the GSH content in glutathione-rich inactivated yeast include: selection of the yeast strain, the production process and the ability of the yeast to release GSH after addition.

BENEFITS OF INCREASED GLUTATHIONE LEVELS DURING WINEMAKING

- Increased colour stability/protection in white and rosé wines.
- The preservation of volatile thiols during ageing.
- Significant increase in esters and terpenes.
- More aroma intensity and balance.
- Increased longevity of the wine with a decrease in the loss of fruity aromas.
- Increased volume and mouthfeel due to the release of polysaccharides.

ADDITION OF GLUTATHIONE-RICH INACTIVATED YEAST

Research has shown that the best results with glutathione-rich inactivated yeast are reported when additions take place in the early stages of alcoholic fermentation. It is also important to ensure that the yeast has sufficient nutrition in the forms of organic and inorganic nitrogen, to avoid the yeast using glutathione as a nutrient source.

PRODUCT SELECTION

	Glutarom	Glutarom Extra
Rehydration		
Aroma enhancing		
Aroma stabilisation and protection	■	■
CONTAINS:		
Inactivated yeast	■	■
Di-ammonium phosphate		
Ammonium sulphate		
Thiamine		
Natural glutathione	■	■
Autolysed yeast		
Yeast hulls		

PRODUCT CATALOGUE

GLUTAROM

Glutarom is a product based on inactivated yeast rich in glutathione and polysaccharides which provide anti-oxidation and anti-aroma deletion properties in white wines.

PROTECTION OF PRIMARY AROMAS AGAINST OXIDATION

APPLICATION:
- Protect against oxidation.
- Enhances varietal thiols.
- Polysaccharides interact and stabilise floral and fruity aroma compounds.
- Stabilisation of colour.

USAGE: Glutarom is best added at the start of alcoholic fermentation or before yeast inoculation in order to benefit from its protective and stabilising effects as soon as possible. In case of a sluggish fermentation, a later addition may be considered in order to preserve the aromas in the must more vulnerable to oxidation. Add Glutarom in a suspension of 10 times its own volume in water or must.

DOSAGE: 15 - 30 g/hL

SKU: 1 KG

GLUTAROM EXTRA

Glutarom Extra is an inactivated yeast product rich in glutathione, protecting the wine against browning and oxidation.

PRESERVATION OF WINES WITH LOW SULPHUR LEVELS

APPLICATION:
- Oxidative protection of the wine.
- Protects aroma compounds.

USAGE: Add Glutarom Extra early, before alcoholic fermentation, for greater efficiency. Add it in a suspension of 10 times its volume in water or must. Once added, stir well by pumping over or applying batonnage.

DOSAGE: 15 - 30 g/hL

SKU: 1 KG

NOTES

CHAPTER 11:
SPECIFIC TREATMENTS

INTRODUCTION

Fining can be described as the addition of a reactive or an adsorptive substance to must or wine, in order to remove (or reduce the concentration of) one or more undesirable constituents.

Fining is a widely used practice that involves adding a substance or mixture in order to clarify, stabilise or modify the organoleptic characteristics of the must or wine. Usually the fining agents bind to the target compound(s) to form insoluble aggregates that are subsequently removed. Fining agents may be composed of animal, mineral and vegetable/plant particles or macromolecules and can include the likes of yeast hulls, inactivated yeast, yeast protein extracts and activated charcoal, as well as animal-derived products like casein and gelatin. In general, fining agents based on yeast derivatives have resulted in wine improvements including decreased turbidity, reduction in astringency and potential stabilisation.

These products can be used to treat a variety of must/wine defaults, including discolouration, removal of reductive compounds, the removal of Ochratoxin A (OTA), detoxification of must and wine, as well as the removal of off-odours and bitterness.

YEAST HULLS

The cell wall of the yeast *Saccharomyces cerevisiae* is composed of a polysaccharide fraction (85-90%) and a protein fraction (10-15%). This results in a percentage of dry weight consisting of approximately:

- 30-40% mannans and mannoproteins
- 30-50% β-1,3-glucan
- 10% highly branched β-1,6-glucan
- Less than 1% chitin content

The use of yeast hulls, comprising of the cell wall and cell membrane complex, can play various roles in the prevention and treatment of issues that can occur during the winemaking process:

- The provision of ergosterol and unsaturated fatty acids are used by the yeast for membrane synthesis.
- The ability to adsorb fatty acids has already been demonstrated in the 1980's. Fatty acids can act as inhibitors during alcoholic fermentation, causing sluggish or stuck fermentations. Under aerobic conditions, fatty acids (decanoic and octanoic acids) participate in the synthesis of sterols that influence the stability and function of the cell membrane. In contrast, under anaerobic/ fermentation conditions, this sterol synthesis slows down and eventually stops. The fatty acids then accumulate in the cell wall of the yeast and have a negative impact on the functioning of the cell membrane and thus the ability of the yeast to metabolise sugar and perform the fermentation. The use of yeast hulls can reduce this inhibitory effect by adsorption of the excess fatty acids and in this way, permit the active yeast cells to metabolise a larger quantity of sugar.
- The ability to prevent/treat sluggish fermentations.
- Restart stuck fermentations.
- The removal of phthalates, OTA and cork and mouldy taints (TCA, TeCA and PCA).

INACTIVATED YEAST

Inactivated yeast display similar adsorption capabilities to that of yeast hulls. These adsorption capabilities are influenced by the microorganism, species and strain. This will determine the cell surface properties (cell surface areas, volume and thickness) that govern the interactions: the capacity, affinity and specificity of the removal of certain compounds. Also, the properties of the adsorbed toxins (polarity, solubility and charge distribution) play a role in the process. Research suggest that the β-1,3-glucan and mannoprotein content are involved in the adsorption capabilities of inactivated yeast, but also in adding to the mouthfeel characteristics of the treated wine.

YEAST PROTEIN EXTRACT

Studies have shown that yeast protein extracts (YPE) represent a more sustainable fining alternative when compared to exogenous substances from mineral, animal proteins or wheat origins. Animal fining agents like casein are well characterised to efficiently interact with problematic oxidisable compounds, due to their affinity for specific flavanol monomers and low molecular weight proanthocyanidins. Despite this efficiency, some animal origin products were shown to cause allergenic or health concerns and their use under certain conditions, must be declared.

YPE are capable of:

- Promoting brilliance/colour improvement
- Reduce turbidity
- Produce compact and homogenous lees
- Reveal different forms of colloidal stabilisation

YPE have shown to be an effective alternative to casein due to its capacity to remove some oxidisable and oxidised species such as phenolic compounds, particularly flavan-3-ol derivatives, considered to be largely responsible for the oxidative ageing of white wines. Studies show the superior effect of YPE on browning prevention, its curative ability, as well as its capability to act as an alternative to gelatin. In addition, the use of YPE results in lower amounts of lees generated with greater compactness, as well as a favourable impact on the sensory characteristics.

ACTIVATED CHARCOAL

Activated charcoal is an amorphous form of carbon that is characterised by a high level of adsorption for many gasses, vapour and colloidal solids. It is generated via the destructive distillation of carbonaceous material and then 'activated' by heating to 800-900°C with steam or carbon dioxide. This then results in a very porous internal structure (almost honeycomb-like) and it is this highly porous structure which supplies a large surface area for interaction. The internal surface measures on average 930 square meter/gram and compounds are physically adsorbed to the large surface area of the carbon particles. The adsorption rate on the carbon surface is typically very fast.

Two forms of carbon are used: decolourising carbon and deodorising carbon. Carbon works as a hydrophobic species, in a similar manner to the first stages of protein-tannin interactions. It is usually used with PVPP (to treat brown discolouration) and bentonite (to facilitate sedimentation).

Carbon can be used to:

- Remove the majority of phenolic classes from wine. Carbon also has activity towards smaller phenolics and anthocyanins, as larger phenolic molecules cannot diffuse into the porous regions of the particles.
- Treat wines with colour problems such as excessive browning or pinking, because carbon is effective at removing non-polar substances, but weak at removing water-soluble components such as sugar and amino acids.
- Remove off-odours from wine.
- The removal of Ochratoxin A (OTA) from wine. OTA is a toxic fungal metabolite produced by several species belonging to the genera *Aspergillus* and *Penicillium*. The occurrence of OTA has been associated with poor sanitation, the consequent development of mould and the contamination of the grapes/wine. The control of the OTA concentration is important for two main reasons: there is a maximum legal limit that has been fixed by the European Community and The International Agency for Research on Cancer has determined it to be a possible carcinogen.

Charcoal is a severe, relatively non-specific fining agent that should only be used/added after benchtop trials.

It is imperative that carefully controlled laboratory fining trials must be performed before any fining agent is added to wines in the cellar. It is very important that preparation methods, temperature, mixing and timing of addition are kept the same between laboratory fining trials and the winery application, in order to ensure/achieve consistent results.

PRODUCT SELECTION

	Extraferm	Acticarbone Eno	Otaclean	Netarom	Fyneo
Composition	**Yeast hulls**	**Active vegetal charcoal**	**Active vegetal charcoal**	**Inactivated yeast**	**Yeast protein extract**
Application	Detoxify	Reduce discolouration	Deodorise Remove Ochratoxin A	Reduce reductive sulphur compounds Improve volume and complexity	Rapid sedimentation Eliminate harsh and bitter back palate notes Preserve aromatic profile
Must					
White wine					
Rosé wine					
Red wine					

PRODUCT CATALOGUE

EXTRAFERM

Consists of pure yeast hulls able to support fermentation and improve wine quality by adsorbing toxic compounds and off-flavours from must and wine.

DETOXIFICATION AND IMPROVING YEAST VIABILITY

APPLICATION:
- Removal of yeast inhibitory compounds like medium chain fatty acids.
- Removal of toxic compounds like Ochratoxin A.
- Removal of anisoles (TCA, TBA and PCA) and dibuthyl phtalates.
- Improve yeast viability and alcohol tolerance.

USAGE: Use at the beginning of fermentation in challenging must conditions (overly clarified). Use at the end of fermentation to increase yeast viability or to treat sluggish or stuck AF or MLF. Use as a detoxifying agent and proceed to rack the wine after treatment.

DOSAGE:
- 20 g/hL (prior to fermentation) / 30 - 40 g/hL (sluggish or stuck fermentation) / 20 - 40 g/hL (detoxification)

SKU: 1 KG

ACTICARBONE ENO

This active vegetal charcoal is a product created for the treatment of discolouration in must and white wines.

REMOVE DISCOLOURATION

APPLICATION:
- Remove discolouration without affecting wine bouquet.
- Can be used with flotation, combined with enzymes and fining additives.
- Treat must as soon as possible, in combination with a pectolytic enzyme.

USAGE: For must, mix directly into the must and eliminate after 24 hours via settling or centrifugation. For wine, mix into five times its volume of water and homogenise during a pumpover, followed by careful stirring. Eliminate after 48 hours of contact via filtration or fining.

DOSAGE: to determine dosage, please contact your technical sales manager (authorised legal dosage: 100 g/hL)

SKU: 15 KG

OTACLEAN

Otaclean is a granular vegetal charcoal adapted to deodorise must and wine and is particularly active in eliminating Ochratoxin A.

REMOVE UNWANTED ODOUR COMPOUNDS

APPLICATION:
- Adsorb wine defects including mould and vegetative aromas.
- Remove Ochratoxin A.
- Low capacity for discolouration.

USAGE: Mix the product into two to three times its volume of water and incorporate the suspension into the must or wine. Homogenise during a pumpover, followed by careful stirring. On must, use Otaclean in association with Rapidase Clear and eliminate after 24 hours of settling or via centrifugation. On wine, eliminate Otaclean after 24 hours (48 hours maximum) contact via filtration or fining.

DOSAGE: 5 - 20 g/hL (organoleptic defects) / 20 - 40 g/hL (Ochratoxin A)

SKU: 1 KG

NETAROM

Derived from inactivated yeast selected for their capacity to adsorb compounds responsible for reductive notes.

REMOVE REDUCTIVE AROMAS

APPLICATION:
- Short-term contact.
- Adsorption of various sulphur compounds (hydrogen sulphide, methanethiol etc.).
- Improves volume and complexity.

USAGE: Addition as soon as reductive notes are observed. The required quantity of Netarom is energetically stirred into four to five times its weight in wine, avoiding lumps. The suspension is added to the wine and lightly stirred once a day to maintain suspension of the product. Taste the wine once a day (before stirring) in order to determine when the treatment needs to be stopped (3-5 days). Do not adjust the SO_2 during the treatment. Rack the wine off the Netarom sediment immediately after the completion of the treatment.

DOSAGE: 20 - 40 g/hL

SKU: 1 KG

FYNEO

An innovative, granulated protein yeast extract for fining white, rosé and red wines.

FINING AGENT

APPLICATION:

- Facilitate rapid sedimentation.
- Refine wines by eliminating harsh and bitter back palate notes.
- Reduce astringency and bitterness.
- Preserve aromatic profile.
- Granulated for easy dispersion.

USAGE: Perfectly disperse granulated Fyneo in 10 times its weight in water. Incorporate this solution into the volume of wine to be treated. Thoroughly homogenise the tank with a pumpover. Rack off after sedimentation. Never prepare the formulation directly in the wine.

DOSAGE: 5 - 15 g/hL (white and rosé wine) / 5 - 30 g/hL (red wine)

SKU: 1 KG

NOTES

CHAPTER 12: MCC

INTRODUCTION

Kaapse Vonkel, a bottle-fermented sparkling wine made in the Traditional French Style, was made for the first time by Frans Malan at Simonsig in 1971. The appellation 'Methode Cap Classique' was started in 1992, with 14 sparkling wine producers in South Africa at the time. Methode Cap Classique (MCC) is the term which describes the South African bottle fermented production of sparkling wines in French methóde Champenoise style.

- any grape varietal can be used, but Pinot noir, Pinot Meunier and Chardonnay are most popular.
- the wine requires a pressure of at least 3 bars inside the sealed bottle to classify as MCC.
- top three export markets for South African MCC include the USA, UK and Sweden.

There are now approximately 224 producers with 300 labels on the market. MCC is also the fastest-growing wine category.

TRADITIONAL METHOD

HARVEST

Grapes destined for sparkling wine production are harvested early, at approximately 17-21°Brix, to preserve the acidity and bright flavours. The selection of the harvesting time is imperative in determining the balance between acidity and ripeness. The optimal ranges for grapes harvested for base wine production are: 17-21°B, pH 2.9-3.2 and TA 8-12 g/L.

PRESSING

Grapes are usually cooled down (or harvested at night) and it is recommended to perform whole bunch press instead of destemming in order to ensure the quality of the juice (whole bunch pressing to be enforced by 2021). A gentle, gradual increase in the pressure ensures delicate juices with low levels of extracted phenols. Analysis of the pH, TA, sugar and SO_2 during pressing is imperative for juice quality.

Traditionally, press fractions are divided as follows:

- Cuvée: the first, most gentle pressing consisting of free run juice and pressed up to 0.8 bar
- Taille: the next press cycle that goes up to 1.2 bar
- Rebêche: final pressing that extracts the most phenolics and tannins

It is recommended to separate the cuvée (more delicacy, understated aromas, refreshing palate and ageing potential) from the taille (lower acid content, more colour, higher mineral content and more aromatic) and allow for the use of these as blending components.

PRIMARY FERMENTATION

The clarified (cold-settling 24-48 hours or flotation) juice is inoculated with yeast and nutrients and this fermentation can take place in stainless steel tanks or wooden barrels. Alcoholic fermentation in base wines can be challenging due to the challenging acid chemistry. Nutrients should be provided in order to ensure sufficient amounts of essential vitamins, minerals, sterols and nitrogen. Yeast nutrition will also minimise stress and the risk of off-flavours being produced. The wine is fermented to approximately 11-12% alcohol.

MALOLACTIC FERMENTATION (MLF)

Whether the process of MLF is desired, is up to the style preference of the winemaker. MLF in base wines soften high-acidity wines and result in better microbial stability. It is also possible to put a portion of the base wine though MLF and blend with non-MLF base wines in order to achieve a balance between acidity, freshness, rounded mouthfeel and fruity aromas. Base wines tend to be very low in pH and require specially adapted/acclimatised bacteria cultures to complete MLF. MLF bacteria can be added at the end of alcoholic fermentation or during co-inoculation (24 hours after the yeast inoculation).

BLENDING

This is the most important step in ensuring a finished wine that is well balanced. Blending allows for the creation of sparkling wines with more complex aromas and flavours. Deeper complexity and consistency can be targeted in non-vintage sparkling wines with the use of reserve wines. The challenge is to predict the development and changes that the wine will undergo during the steps of the second fermentation and maturation.

TARTRATE STABILISATION

The formation of tartrate crystals are unsightly and can cause gushing of the finished wine.

CLARIFICATION

Various methods for clarification exist, filtration is most commonly used.

TIRAGE / BOTTLING

A mixture of yeast, sugar, nutrients and a riddling adjuvant is added to the base wine, kept in suspension by mixing and then added to each bottle for the second fermentation. A high population yeast culture is used to inoculate the base wine/sugar mixture for the second fermentation. The creation of the yeast inoculum involves two days of building up the yeast population, whilst gradually acclimatising them to the wine environment.

Common challenges with the yeast inoculum:

- the population is too low: this is usually as a result of too little oxygen during the multiplication phase and not enough nitrogen
- the alcohol level is too high: this is a result of adding too much sugar to the mixture
- the 'pied de cuve' has too much sugar once ready for use: delay the bottling date and increase the temperature for faster sugar consumption
- the 'pied de cuve' has no sugar: check the yeast viability as they may have started to die off, make a complementary sugar addition and delay bottling
- for assistance, contact your technical sales manager

BIDULING AND CROWN CAPPING

After bottling, each bottle is fitted with a bidule stopper and a crown cap closure. The bidule aids in collecting the lees after riddling has been completed and makes for an easier disgorgement. The crown cap acts as a temporary closure and allows for the ingress of oxygen into the bottle during ageing to influence the final sensory qualities of the finished wine.

SECONDARY FERMENTATION

The secondary fermentation or 'prise de mousse' is carried out in the bottle. Due to the depletion of nutrients during the primary fermentation and the adverse fermentation conditions (low temperature and pH), it is essential to supply the yeast with adequate nutrition in the form of ammonia and thiamine. The bottles are left to rest horizontally while the fermentation completes over the course of 6-8 weeks. It is then up to the winemaker to decide on the length of time the wine will age on the lees, depending on the style of wine desired. The ageing of the wine is usually carried out away from light and at an ambient temperature of approximately 12-13°C. Currently, the required ageing period is 9 months, that will be extended to 12 months in 2021.

RIDDLING

This is the process of gradually tipping and shifting the bottles upside down over a period of time in order for the lees to slowly move down to the neck of the bottle whilst gravity drives the sedimentation. This process can be done manually or mechanically.

DISGORGING

The aim of disgorgement is to effectively remove the sediment in the neck of the bottle, with minimum loss of wine or pressure. Prior to removing the crown cap, the bottles are cooled and the top section of the neck is frozen in a glycol solution. This allows the cap to be removed and the bidule with the sediment to be expelled. This process can be performed manually or by machine.

DOSAGE

The dosage (liqueur) is the final opportunity to impart a specific style to the wine. Many winemakers and wineries have their own special recipes that can contain sugar, wine, distilled spirits etc. The dosage will also determine the sugar level of the finished wine and will influence the classification as Brut Natural, Extra Brut, Brut, Extra Dry, Dry, Semi-Sweet or Sweet.

PRODUCT CATALOGUE

PRESS

SULFITANIN LIQUID

Sulfitanin Liquid is a solution of ammonium bisulphate and tannin at 100 g/L of pure SO_2 and is used to adjust sulphur dioxide levels in must. In the must tank for white wine production, Sulfitanin Liquid prevents oxidation and microbiological alterations.

SULPHUR ADJUSTMENT

APPLICATION:
- Antiseptic action prevents the growth of indigenous undesirable yeast and bacteria.
- Prevents oxidation.
- Helps to extract colour.
- Tannins reinforce the anti-oxidant mechanism of SO_2 and gives better structure and ageing ability, without increasing the astringency in white wines.

USAGE: The addition of Sulfitanin Liquid must be followed by good homogenisation in the must. Avoid any contact between Sulfitanin Liquid and metallic objects.

DOSAGE: 50 - 80 ml/hL (white and rosé)

SKU: 5 L / 10 L

ENZYMES

CLEAR EXTREME

An enzyme for fast, efficient clarification of grape must in difficult and extreme conditions. The use of this enzyme allows for more compact lees and clearer must when settling conditions are difficult, including low temperatures, pH and/or hard to settle varieties.

CLARIFICATION IN DIFFICULT CONDITIONS

APPLICATION:
- Pectin and side chain degradation down to 6°C.
- Decreases viscosity.
- Promotes solid particle aggregation.
- Decrease in settling time and turbidity.
- Increase in clear juice percentage.

USAGE: Add as early as possible after pressing. Use the maximum dosage at temperatures below 10°C. Dilute 10 times prior to addition. Active from 10-50°C and the activity increases with temperature. Active within the wine pH range and normal concentrations of SO_2. Eliminated by bentonite and charcoal.

DOSAGE: 1 - 4 g/hL

SKU: 100 G

INOZYME

Inozyme is a lyophilised pectolytic enzymatic preparation with a very broad spectrum of activity, which helps to accelerate the clarification of must and improve the filtration of the wine. To be used for the production of white and rosé wine.

CLARIFICATION AND FILTRATION

APPLICATION:
- For the clarification of juice at low pH (<3.0) and low temperature (<10°C).
- For the clarification of grapes that were mechanically harvested.
- For the clarification of rosé wine produced in the saignée method.

USAGE: Dissolve the contents of 50 g in 1 L of cold water, mix until completely dissolved. Add to must via pumpover and mix thoroughly. Use a drip or metering system to optimise blending within harvested grapes or must. Avoid simultaneous addition of bentonite that will remove the enzyme.

DOSAGE: 1 - 4 g/hL (must) / 1 g/hL (wine)

SKU: 50 G

INOZYME TERROIR

Inozyme Terroir is a highly concentrated clarification enzymatic preparation to clarify white and rosé must, as well as juice derived from thermovinification.

CLARIFICATION UNDER DIFFICULT SETTLING CONDITIONS

APPLICATION:
- Clarification of white and rosé must below 10°C.
- Suitable for grape varieties rich in pectins.
- Suited for grapes that were mechanically harvested.
- Suitable for use under accelerated pressing conditions.
- Suitable for use on immature grapes.
- Clarify must from thermovinification.

USAGE: Dissolve the contents of 50 g in 500 mL of cold water and mix until fully dissolved. This solution will remain stable for about 36 hours. Incorporate it as soon as possible: in the receiving hopper, the press or, failing that, add it to the must in the sedimentation tank. If using it with thermovinification, it is best to add the enzymes even before heating the harvested grapes, but the temperature of the grapes should not exceed 60°C. If the temperature is higher, wait for the cooling phase before adding the enzymes. Avoid the simultaneous addition of bentonite that will remove the enzyme.

DOSAGE: 1 - 5 g/hL (must) / 10 - 50 ml/hL (liquid suspension)

SKU: 50 G

CLARIFICATION

QI-UP XC

A concentrated chitin derived flotation additive that is natural, biodegradable and non-allergenic, containing no products of animal origin. This is a biopolymer-based formula with a very high surface charge at wine pH and this enhances flocculation.

CONCENTRATED SOLUTION FOR THE FLOTATION OF WHITE, ROSÉ AND RED JUICE

APPLICATION:
- Enhances the speeds and performance with which the particles separate from the suspension.
- Alternative to the use of animal products such as gelatin.

USAGE: Mix the Qi-UP XC in 10 times its own weight in water in order to achieve a uniform suspension. In use, the mixture needs to be stirred constantly. A dosing pump or a fining connection is advised.

DOSAGE: 3 - 10 g/hL (white or rosé must)

SKU: 1 KG

YEAST

18-2007

S. cerevisiae

SPARKLING WINES

DESCRIPTORS: neutral

APPLICATIONS: all sparkling base wines

NOTES:
- Fermentation in the bottle.
- Fermentation under difficult conditions (low temperature and pH).
- Restarting stuck fermentations.
- Respects varietal character.

DOSAGE: 10 - 20 g/hL (white wine) / 20 - 25 g/hL (red wine) / 10 - 20 g/hL (restart stuck fermentation and fermentation in the bottle)

SKU: 500 G

VIN 13

Stellenbosch University
S. cerevisiae subsp. cerevisiae x S. cerevisiae subsp. bayanus hybrid

AROMATIC WINES

DESCRIPTORS: aromatic and fruity

APPLICATIONS: all varieties

NOTES:
- Robust and aromatic.
- Fast fermentation rate.
- Extremely sugar, alcohol and cold tolerant.
- Restart stuck fermentations.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG / 10 KG

N 96

Agricultural Research Council, Nietvoorbij
S. cerevisiae subsp. bayanus

STRONG FERMENTING, ALL-PURPOSE WINE YEAST

DESCRIPTORS: neutral sensory contribution allows varietal character to dominate

APPLICATIONS: all varieties

NOTES:
- Primary and secondary fermentations of MCC wines.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG

NUTRITION

ACTIVIT NAT

Activit Nat is a fermentation activator consisting of inactivated yeast. This nutrient provides amino acids, small peptides and stress resistance factors that are adsorbed by the yeast throughout alcoholic fermentation. This activator is intended for musts with low or moderate nitrogen deficiencies. It does not compensate for particularly high nitrogen deficiencies.

FERMENTATION ACTIVATOR

APPLICATION:
- Balanced alcoholic fermentation.
- Completion of alcoholic fermentation.
- Contributes to organoleptic quality of the wine.
- Reduces the risk of the production of sulphur compounds.

USAGE: Put Activit Nat in solution into 10 times its weight in must or wine and incorporate the mixture into the tank. Carry out a pumpover with aeration to homogenise.

DOSAGE: 20 g/hL (must), followed with 20 g/hL (during first third of alcoholic fermentation)

SKU: 1 KG

ACTIVIT

A mixture of ammonium salts, inactivated yeast and thiamine to be used during a sluggish alcoholic fermentation and to maintain the fermentation when there is a nitrogen deficiency in the must.

SLUGGISH ALCOHOLIC FERMENTATION

APPLICATION:
- Provides ammonia and amino acid nitrogen.
- Adsorbing the short chain fatty acids that can inhibit fermentation.
- Providing sterols and long chain fatty acids which are essential precursors in maintaining yeast viability.

USAGE: Dissolve in ten times its weight in must or wine and add to the juice via pumpover. If using it to restart a fermentation, add the product to the wine prior to yeast addition.

DOSAGE: 20 - 40 g/hL (preventative treatment and mid-fermentation) / 40 - 50 g/hL (restart a stuck fermentation)

SKU: 1 KG

MLF

ANCHOR DUET SOFT

Institute for Wine Biotechnology, Stellenbosch University
Bacteria blend of Oenococcus oeni x Lactobacillus plantarum

ENHANCED MOUTHFEEL AND SOFTNESS

APPLICATION:
- Enhanced mouthfeel.
- Decreased green characters.

USAGE: Co-inoculation - inoculate on the same day as the yeast. Rehydration in chlorine-free water for no more than 15 minutes.

DOSAGE: 1 g/hL

SKU: 25 G (25 HL)

INOBACTER

Inobacter is a bacteria for inoculating for malolactic fermentation in white and rosé wines that requires three steps: reactivation, starter culture and inoculation. This three stage process enables the bacteria to adapt to very low pH conditions.

LOW PH MUST AND WINE

APPLICATION:
- Tolerant of very low pH conditions (>2.9).

USAGE: Suitable for co-inoculation, inoculation during alcoholic fermentation or sequential inoculation. The Inobacter kit contains a sachet of oenological bacteria and a sachet of special activator. Contact your technical sales manager for instructions.

DOSAGE: 0.72 g/hL (bacteria) / 4 g/L (reactivation medium)

SKU: 25 HL / 100 HL / 1000 HL

NUTRIFLORE FML

Nutriflore FML is a nutrient based on inactivated yeast selected for their high level of nutrition and survival factors and is designed to accelerate malolactic fermentation.

MALOLACTIC FERMENTATION

APPLICATION:
- Provides elements required for the proper growth of the bacteria (amino acids, minerals and vitamins).
- Provides peptides needed by the bacteria to increase resistance to the wine acidity.
- Effective for wines with a low pH (<3.4).

USAGE: It is recommended to add Nutriflore FML 48 hours before inoculating with bacteria, but it can also be added at the time of inoculation. For the best dispersion, prepare a suspension beforehand in a small quantity of water or wine.

DOSAGE: 20 g/hL

SKU: 1 KG

SECOND FERMENTATION

EXTRA PM

Extra PM is a fermentation activator specifically intended for bottle fermentation and contains inactivated yeast that is naturally rich in glutathione.

FERMENTATION ACTIVATOR FOR BOTTLE FERMENTATION

APPLICATION:
- Guarantees optimal yeast activity during bottle fermentation.
- Retains membrane exchange capacity, especially in the case of continuous yeast starter cultures.
- Guarantees the optimal physiological state of the yeast, especially after 2.5 kg pressure.
- Improved wine ageing potential.
- Limits reduction phenomena during bottle fermentation.
- Conservation of varietal and fruity aromas.
- Enhances roundness, elegance and length in sparkling wines.

USAGE: Put Extra PM into solution in 10 times its weight of wine and incorporate into the mixture. The use of Extra PM must be accompanied by an addition of Phosphates Titres into the mixture, in order to secure the bottle fermentation.

DOSAGE: 10 - 30 g/hL

SKU: 1 KG

PHOSPHATES TITRES

Phosphates Titres contains diammonium phosphate and thiamine to ensure regular yeast multiplication and complete and regular sugar utilisation. It is recommended for sparkling wine production.

FERMENTATION ACTIVATOR FOR SPARKLING WINES

APPLICATION:
- Thiamine helps to maintain yeast viability.
- Encourages fast start to alcoholic fermentation.
- Ensures an even supply of nitrogen right to the end of fermentation.
- Optimise fermentation efficiency.

USAGE: Dissolve Phosphates Titres in 10 times its volume of cold water before adding to the wine.

DOSAGE: 5 g/hL

SKU: 1 KG / 5 KG

18-2007

S. cerevisiae

SPARKLING WINES

DESCRIPTORS: neutral

APPLICATIONS: all sparkling base wines

NOTES:
- Fermentation in the bottle.
- Fermentation under difficult conditions (low temperature and pH).
- Restarting stuck fermentation.
- Respects varietal character.

DOSAGE: 10 - 20 g/hL (white wine) / 20 - 25 g/hL (red wine) / 10 - 20 g/hL (restart stuck fermentation and fermentation in the bottle)

SKU: 500 G

N 96

Agricultural Research Council, Nietvoorbij
S. cerevisiae subsp. bayanus

STRONG FERMENTING, ALL-PURPOSE WINE YEAST

DESCRIPTORS: neutral sensory contribution allows varietal character to dominate

APPLICATIONS: all white varieties

NOTES:
- Neutral sensory contribution.

DOSAGE: 20 g/hL

SKU: 1 KG

SKU AVAILABLE ON PRE-ORDER: 5 KG

CLARIFIANT XL

This is a riddling additive offering excellent fining properties. This product gives a high degree of clarification and sedimentation, which is particularly effective for difficult riddling operations.

CLARIFICATION DURING RIDDLING

APPLICATION:
- A high degree of clarification and sedimentation during riddling.
- Suitable for manual and automated riddling.

USAGE: Incorporate Clarifiant XL just before racking, after having added and thoroughly blended the liqueur and the yeast. Stir continuously throughout the bottling process.

DOSAGE: 60 - 80 ml/hL (sparkling white wines) / 80 - 100 ml/hL (sparkling red or rosé wines)

SKU: 1L / 5 L / 10 L

CLARIFIANT BK

This product helps to create compact sediment in the bottle and assist its movement down the bottle during riddling. It has a gentle mode of action producing brilliantly clear wines.

CLARIFICATION DURING RIDDLING

APPLICATION:
- Create compact sedimentation during riddling

USAGE: Dissolve 600 g of powder in small amounts at a time in cold water and mix vigorously for one hour. Leave to swell for 6-12 hours mixing occasionally. Add the mixture to the wine immediately before bottling and ensure the resultant mixture is continually homogenised.

DOSAGE: 80 ml/hL of the prepared solution

SKU: 1 KG

SOLUTION ST

Solution ST is a liquid preparation comprising of Tara tannins and copper sulphate.

PRESERVATION DURING RIDDLING

APPLICATION:
- Prevents oxidation.
- Acts as preventative and curative treatment for reductive odours.
- Assists clarification during riddling.
- Reinforces the ageing potential of the wine.

USAGE: Add directly to the wine at the same time as riddling agents. Ensure thorough mixing.

DOSAGE: 20 - 40 ml/hL

SKU: 1 L / 10 L

DOSAGE

FINAL TOUCH POP

This is a unique mannoprotein-based solution that enhances the organoleptic qualities of sparkling wines, while also preserving their elegance, freshness and balance. The fermentation aromas and minerality of wines treated with Final touch POP remain predominant during ageing and storage. The development of oxidative aromas (hints of ripe fruit, nuts and honey) is attenuated and tannins are less astringent.

IMPROVE THE QUALITY OF SPARKLING WINES

APPLICATION:

- Improves the wine's structure and bubble quality.
- Provides a refined aromatic profile and persistence.
- Aids in elegance, freshness and balance.
- Provides smooth and round mouthfeel.
- Limits oxidation to increase longevity.
- Reduces astringency of rosé and tannic sparkling wines.
- Can also refresh base wines.

USAGE: Final touch POP is completely soluble and can be added directly to the wine. Add homogenously to sparkling wines after the second fermentation, immediately before bottling (Charmat method), or to the dosage or liqueur added after disgorging (traditional method).

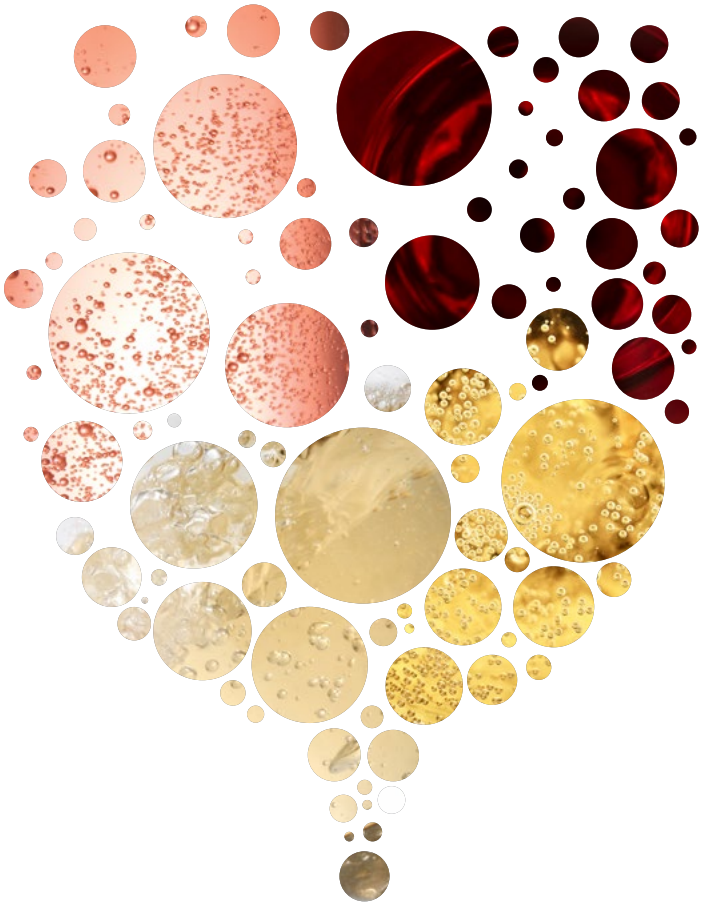
DOSAGE: 20 - 40 ml/hL

SKU: 1 L

NOTES

NOTES

Anchor
OENOLOGY
Supporting you from grape to glass



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