

# CENOLOGICAL YEASTS



Characterisation, Expression, Distinction

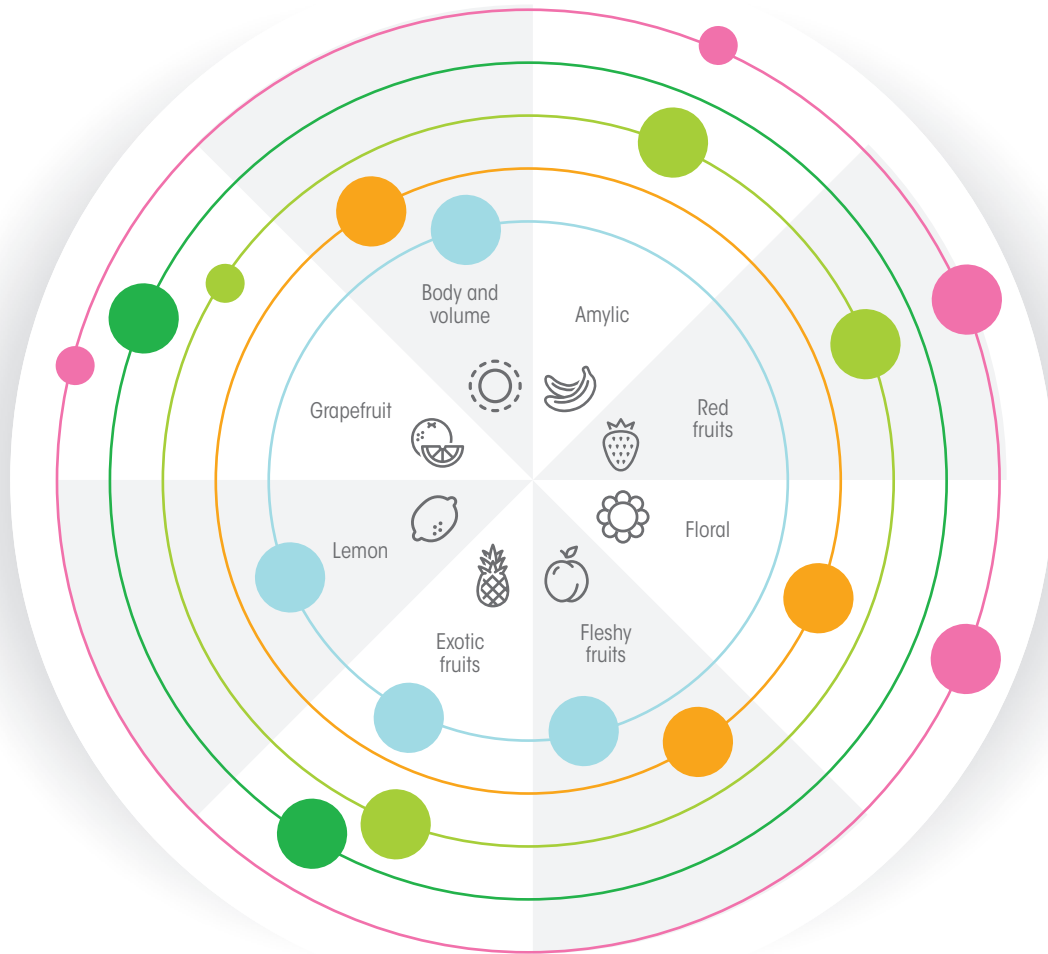


**IOC**

*Révétons votre différence*

# WHITE AND ROSÉ WINES

**A**romatic expression is extremely important when it comes to perceiving the quality of white or rosé wines. It often depends on the action of the yeast during the fermentation process. The main aromatic fractions of these wines are present in the grape in the form of odourless precursors and require distinct yeast enzyme actions to be brought out. Yeasts selected by IOC make it possible to target these fractions specifically, unifying terroir, variety and sensory objective.



		DOMINANT NOSE	DOMINANT MOUTH
<b>IOC Twice</b>	Perfect balance between full-bodiedness and final freshness of white wines	Fruity esters of medium-chain fatty acids	Body + Freshness + Length
<b>IOC B 3000</b>	Fleshy fruits, floral notes and full-bodiedness of white wines	Fruity esters of short-chain fatty acids	Body
<b>IOC B 2000</b>	Freshness and aromatic intensity of white and rosé wines	Fruity acetate esters	Intensity
<b>IOC Révélation Thiols</b>	Full expression of fruity thiols on white or rosé musts	Fruity thiols	Freshness + Roundness
<b>IOC Fresh Rosé</b>	Floral and varietal expression of rosé wines	Fruity esters + C13-norisoprenoids	Freshness + Intensity

# ↘ WHITES OR ROSÉS : THE MAIN AROMATIC FAMILIES

## ↘ VARIETAL THIOLS

Typical of certain varieties, the three main varietal thiols in wines are :

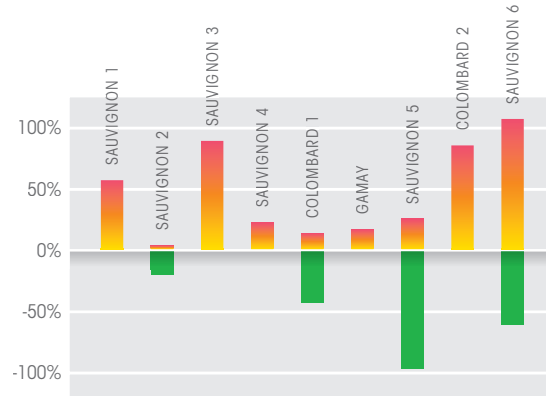
- **3MH** : aroma of grapefruit and other citrus fruit
- **acetate of 3MH (A3MH)** : aroma of passion fruit
- **4MMP** : aroma of boxwood, guava

Some selected yeasts bring out one or another of these substances, present in the form of odourless precursors in grapes in high concentrations (sauvignon, colombard, syrah) or more moderate concentrations (grenache, pinot, merlot).

- **3MH**: Production enhanced by IOC Révélation Thiols
- **4MMP**: Production enhanced by control yeasts

### Bringing out 3MH and 4MMP varietal thiols (0% = concentrations obtained by control yeasts)

Variations in concentrations obtained by IOC Révélation Thiols in comparison to those obtained by control yeasts



## ↘ ESTERS

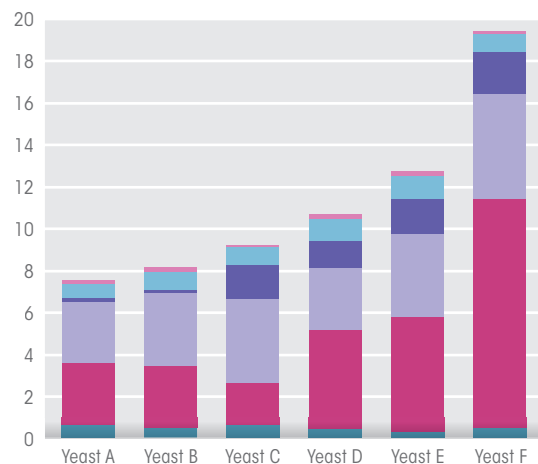
- **acetate esters** (including isoamyl acetate): these esters with fresh fruit aromas (banana, peach...) or flowers are well-known for their intensity but also their short self-life.
- **short- or medium-chain fatty acid esters** : generally more stable over time, these substances contribute to aromas of fleshy fruit, citrus or red fruit.

Esters are all produced from must substances (amino acids, fatty acids), some more than others depending on which yeast is being used and fermentation conditions (temperature, turbidity, nutrition, pH...).

- Phenylethyl acetate
- Isoamyl acetate
- Ethyl butyrate
- Ethyl hexanoate
- Ethyl octanoate
- Ethyl decanoate

### Fatty acid and acetate esters depending on which yeast is being used - Trial 2012, sauvignon Val de Loire

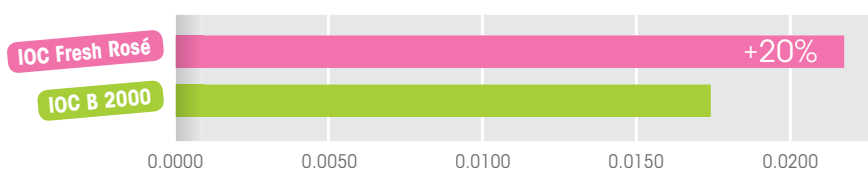
Olfactory units (concentration / perception threshold)



## ↘ GLYCOSYL AROMAS

These aromas are generally linked to sugars which make them odourless. The enzyme action of some yeasts enables significant and selective liberation of these substances :

- **Terpenic substances** : aromas of flowers, lychees, citrus fruit, typical of varieties such as muscat.
- **C13-norisoprenoid derivatives (beta-ionone, beta-damascenone)** : aromas or enhancers of fruity aromas.

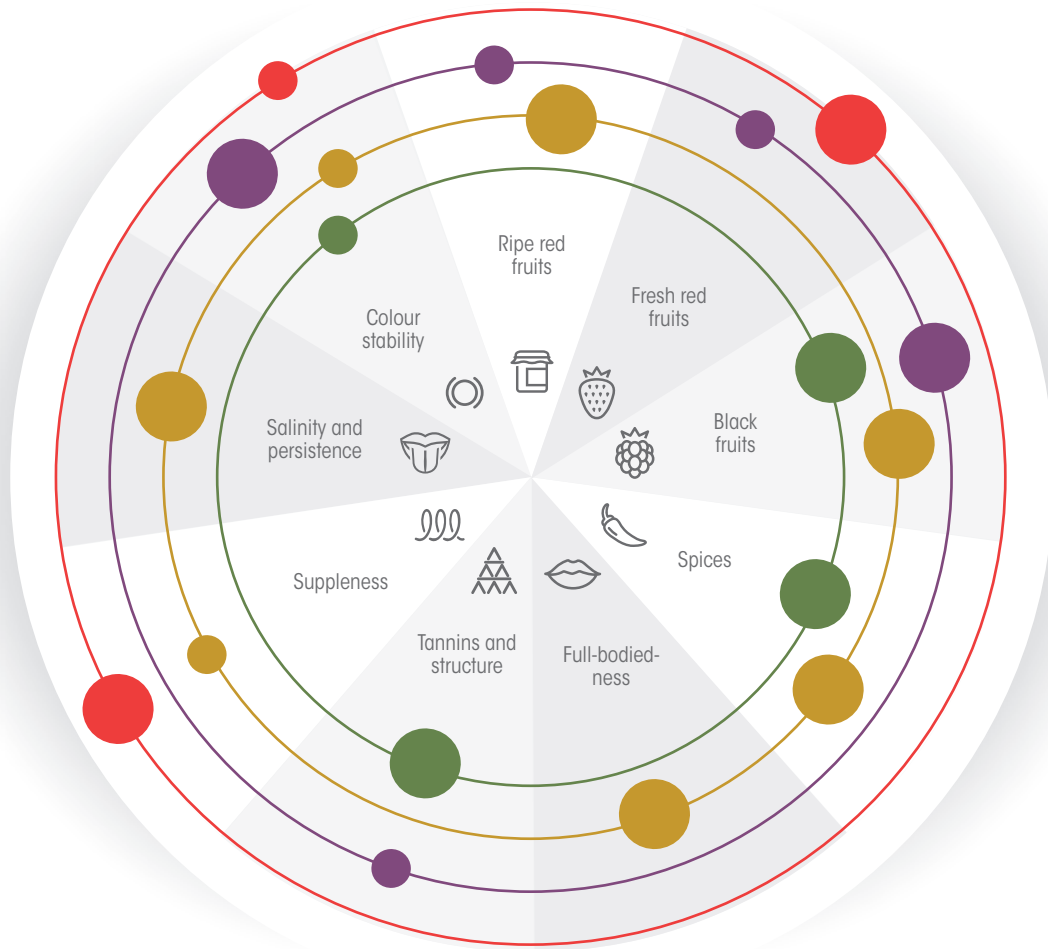


**Beta-damascenone**  
(mg/L)  
grenache/syrah 2009

+20%

# RED WINES

To meet raw material constraints (variety, technological, phenolic and aromatic maturities) and various market requirements (colour, suppleness, structure, body and aroma typology), IOC has selected a range of yeasts with specific capacities, both in terms of olfactory definition and texture.



		DOMINANT NOSE	DOMINANT MOUTH
<b>IOC R 9002</b>	<b>Spices, black fruit and structure of wines for aging</b>	Black fruits	Structure
<b>IOC R 9008</b>	<b>Body, aromatic maturity and longevity of red wines</b>	Mature fruits	Body + Length
<b>IOC Révélation Terroir</b>	<b>Finesse, fruitiness and colour of red wines</b>	Varietal fruitiness	Length
<b>IOC Primrouge R 9001</b>	<b>Benchmark for early, primeur red wines</b>	Amylic fruitiness	Suppleness + Intensity

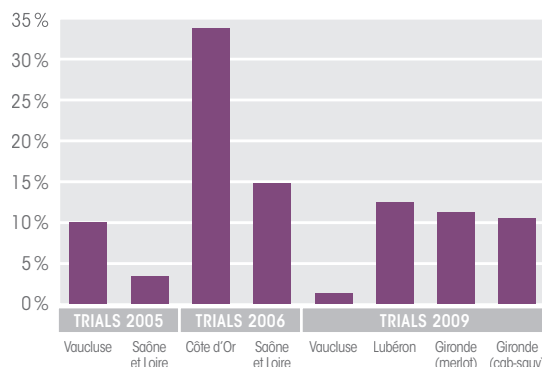
# ➤ IMPACT OF YEASTS IN RED WINE : KNOWN MECHANISMS

## ➤ ACTION OF YEASTS ON THE COLOUR OF WINES

- **By adsorption:** some yeasts tend to fix pigments, which slightly discolours the wine,
- **By increasing pH:** when pH is low, anthocyanins are more under their coloured form,
- **By producing polysaccharides:** these complex molecules can attach themselves to pigments and stabilise them over time,
- **By producing SO<sub>2</sub> and/or ethanal:** SO<sub>2</sub> discolours while moderate quantities of ethanal contribute to stabilising pigments.

### IOC Révélation Terroir: a yeast which can stabilise colour - Increase in colouring intensity in comparison to control yeasts (%)

Variations in colouring intensities measured in wines obtained via IOC Révélation Terroir in comparison to wines fermented by control yeasts.

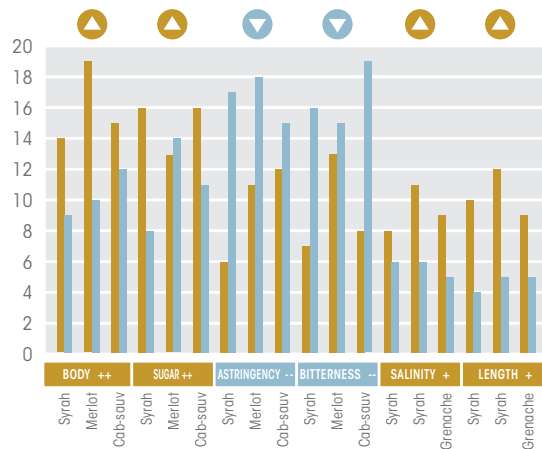


## ➤ YEASTS AND TEXTURES

- **Coating tannin:** some yeasts have the natural capacity to release polysaccharides which have a strong affinity with tannins at an early stage, therefore contributing to reducing astringency and bitterness.
- **Sensation of richness and body:** other yeast polysaccharides contribute to onctuousness of wines.
- **Flavours and length:** some yeasts release substances (in particular peptides) that have an action on sugar and salinity, and these can also affect the perception of flavours in the mouth (intensity and persistence).

### IOC R 9008: a yeast which enhances full-bodiedness, length and salinity of wines

Number of tasters choosing the wine



● IOC R 9008 ● Benchmark yeast

## ➤ IMPACTING AROMAS, EVEN IN RED WINE ?

- **Esters** : produced by yeasts, their role in the typicality of red wines (red or black fruits) has been illustrated.
- **Varietal thiols** : in red, they act particularly on blackcurrant aromas.

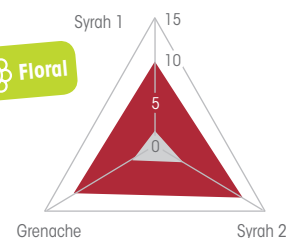
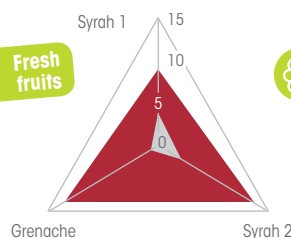
- **Beta-damascenone** : enhances red wine fruitiness and represses plant-based aromas.

- **Dimethylsulfide** : depending on their nitrogen needs, yeasts more or less preserve the DMS potential, with an aroma of truffles.

### A yeast which enhances aromas of fresh fruits and flowers

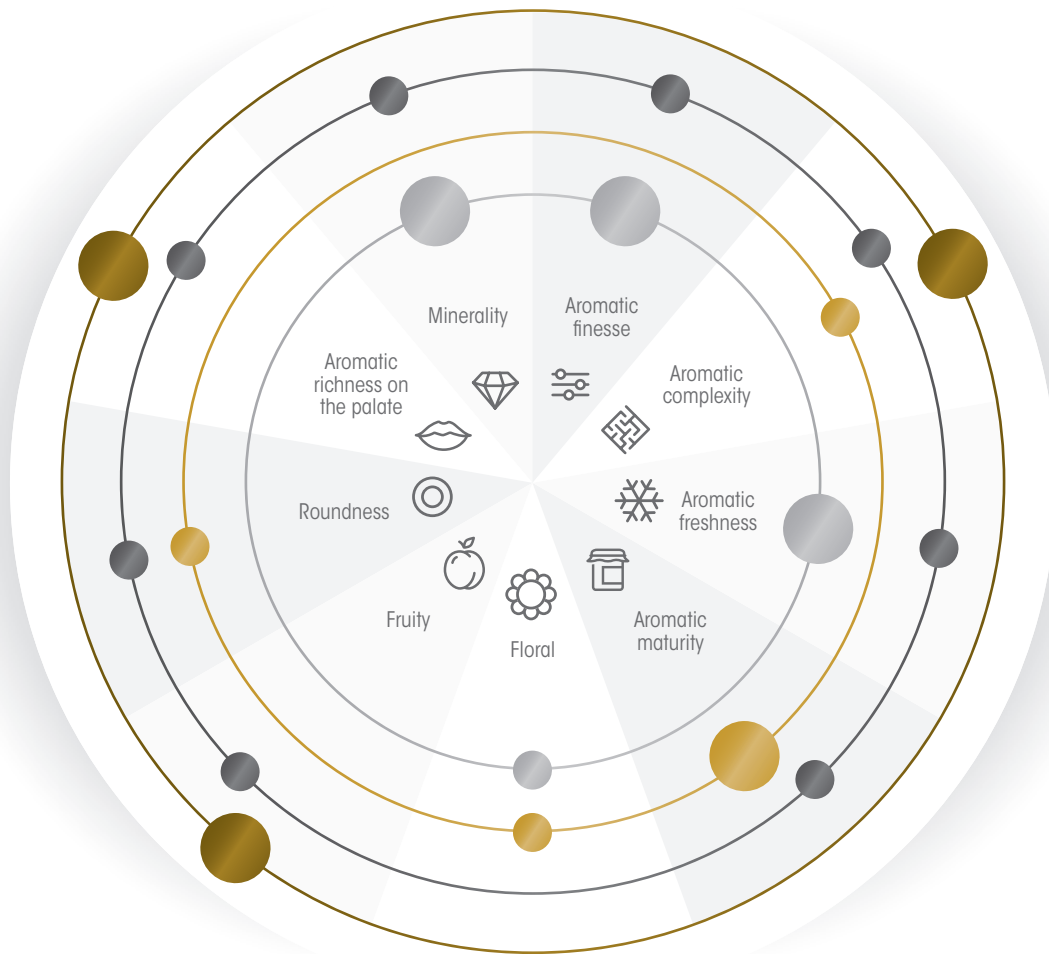
Sensory analyses of 3 trials

● Yeast A ● Benchmark yeast



# SPARKLING WINES

**S**parkling wines are particularly sensitive when it comes to bringing out aromatic substances, and the balance for achieving elegance is fragile. The action of certain substances of yeast origin on the quality of bubbles and, more generally, taste sensations is well known. In addition to real fermentation capacities, yeasts approved by the Institut Oenologique de Champagne have various sensory capacities which provide clear differentiation between sparkling wines, while respecting their finesse.



		METHOD	TYPE OF ELEVAGE	WHAT USERS SAY
<b>IOC 18-2007</b>	<b>World benchmark for elegance</b>	Traditional	>12 months	«Over the long term, no other yeast equals the elegance it imparts.»
<b>IOC Divine</b>	<b>Complexity and full-bodiedness</b>	Traditional	>12 months	«For the same elevage time, it provides peerless roundness and full-bodiedness»
<b>IOC Fizz</b>	<b>Efficient bubble formation</b>	Charmat Method	3 to 9 months	«If you're looking for elegance using the Charmat method, IOC Fizz is the right choice.»
<b>IOC Fizz+</b>	<b>Bringing out fruity notes</b>	Charmat Method	1 to 3 months	«The aromatic benchmark for sparkling wines for rapid commercialisation.»

## ▾ SPECIFIC CHARACTERISTICS OF A YEAST FOR SPARKLING WINES

### ▾ CHALLENGING BUBBLE FORMATION

The characteristics of a basic wine are extremely unfavourable when it comes to fermentation, in comparison to the optimum conditions for yeast growth :

PARAMETERS	BASE WINE	OPTIMUM CONDITIONS
Temperature (°C)	11 - 15	25 - 30
Free SO <sub>2</sub> (mg/L)	5 - 15	0
Alcohol content (% vol.)	11 - 11,5	0
pH	3,0 - 3,2	5,6

*B. Duteurtre*

- Consequently, the preparation of a starter culture is considered as an essential stage in a successful bubble formation. Choosing a yeast strain which is suited to these processes and dedicated to bubble formation is fundamental to ensure an optimum yeast.

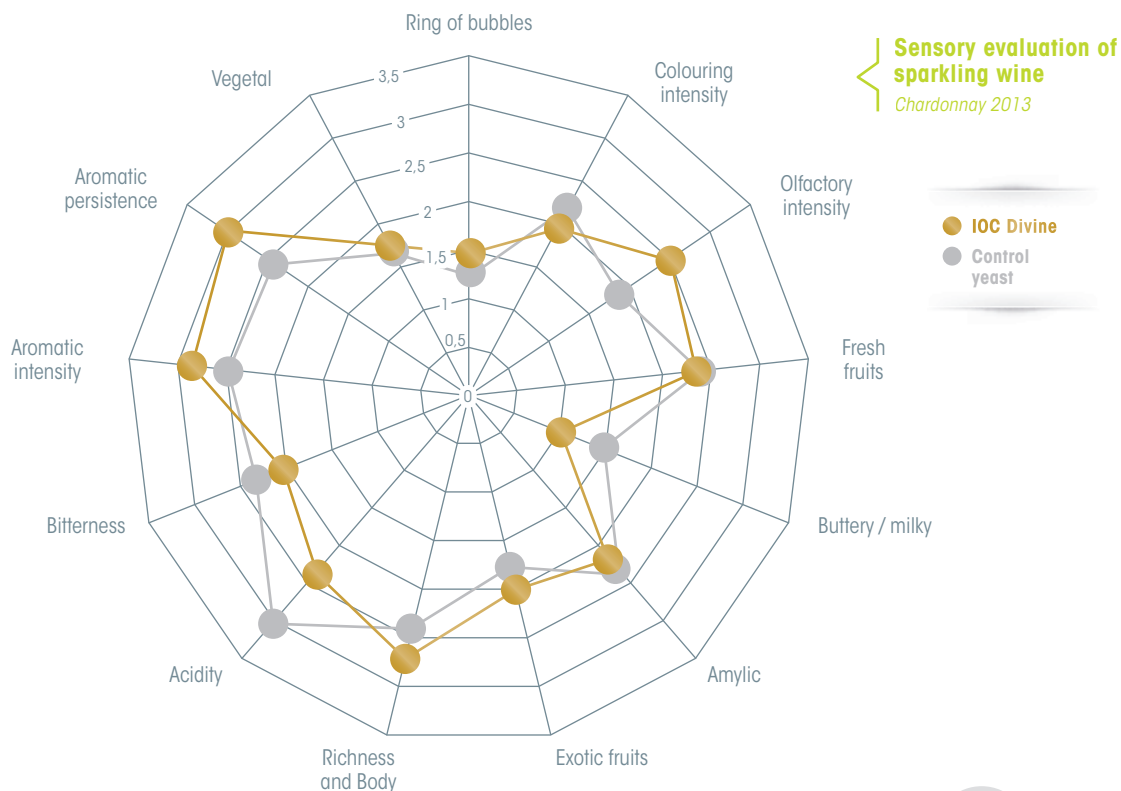
- Nevertheless, this selection is not limited to the yeast's aptitude to ferment; it must also meet the specific requirements of sparkling wines in terms of sensory profiles.

This double challenge in the selection process produces truly dedicated and remarkable yeasts.

### ▾ VOLUME AND AUTOLYSIS

- Some yeasts are selected for their autolytic capacity, i.e. their ability to fragment rapidly and completely at the end of their life cycle, and in so doing transmit substances which contribute to full-bodiedness and aromatic complexity.

- In a sparkling wine, contact between the wine and lees is vital for product quality, and a yeast with a high autolytic potential can prove to be a powerful tool in balancing sensations of acidity and roundness, while at the same time contributing to length in the mouth.



# NEW HORIZONS



## IOC BIO

*Organic-certified yeast, respecting varieties and terroirs*

No so-called «technological» aromatic contribution

Full and balanced expression of variety and terroir

Resulting from an exceptional organic production process (SGS certification)

IOC BIO is suited to all colours of wines, still or sparkling.

All IOC yeasts may be used in organic vinification in line with current European regulations, but, in addition, IOC BIO also has the specific feature of having itself been produced in compliancy with specifications for organic certification.

The fact that it does not confer any technological aroma also makes it ideal for wines developed via conventional vinification where respect of terroir is essential.



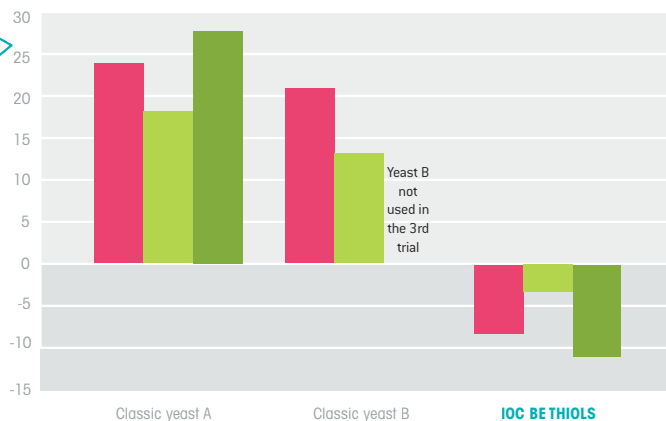
## IOC BE THIOLS

*Dry active yeast - Controlling sulphite contents for wines rich in fruity thiols*

A tool aims to provide thiolated wines with low level in sulphites. Outcoming and resulting from an innovative research program, the IOC BE range of yeasts combines a high-level of sensory skills to master the lack and/or inability to produce SO<sub>2</sub> and sulphurous/sulfur aromas.

Concentrations in total SO<sub>2</sub>: differences between wine and must

- Rosé Grenache (initial sulphiting 30 mg/L - pH 3.30 TAV 14% vol)
- White Sauvignon (initial sulphiting 50 mg/L - pH 3.30 TAV 12.25% vol)
- White Sauvignon (initial sulphiting 40 mg/L)

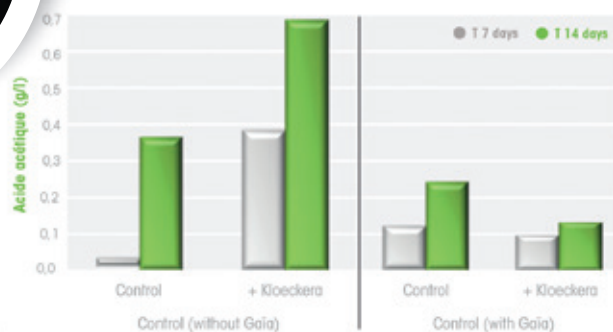


Formation of SO<sub>2</sub> during the fermentation of two musts depending on the inoculated yeast: whereas reference yeasts produce SO<sub>2</sub> in addition to the initially added quantity, wines fermented using IOC BE THIOLS have final sulphite contents which are lower than the initial concentration.



## IOC GAIA

Production of acetic acid by *Kloeckera apiculata* with or without Gaïa™ in a must (sugars 230 g/l, pH 3.20, no SO<sub>2</sub>, pasteurization) - (SD : 0.05 g/l)



Gaïa™ use during pre-fermentary stages (such as cold pre-fermented macerations) allows a natural protection against micro-organisms alteration due to the action of the *Metschnikowia fructicola* yeast which helps and prevents the proliferation of undesired metabolite populations (such as the volatile acidity). Sulfiting steps can consequently be limited.

The quite low fermentary action and power of Gaïa™ makes it a safe and active asset during pre-fermentary extraction without triggering the fermentation at an early stage.

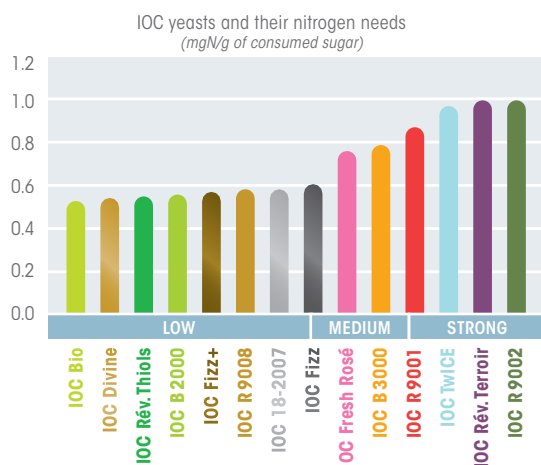
# CHARACTERISTICS OF YEASTS : GLOSSARY

## ↘ KILLER FACTOR

Yeasts with a K2 Killer factor produce a toxin able to kill yeasts which do not produce any, thereby facilitating establishment in the must.

## ↘ NITROGEN NEEDS

The needs of a moderately demanding yeast are 150 mg/L of assimilable nitrogen for a must with TAP = 12.5% vol. These needs may vary according to the potential alcohol content and the yeast strain.



## ↘ PRODUCTION OF VOLATILE ACIDITY (ACETIC ACID)

The production of acetic acid (odour of vinegar) is strongly linked to the must to be fermented, but some yeasts produce less than the average.

## ↘ PRODUCTION OF GLYCEROL

Glycerol, which is thought to foster sensations of richness and roundness, is produced with more or less strength depending on various factors, such as temperature, potential alcohol or yeast strain.

## ↘ PRODUCTION OF SO<sub>2</sub>

Indigenous yeasts are liable to produce high quantities of SO<sub>2</sub>, rapidly combined and with little useful antioxidant effect. Some selected yeasts produce much less. Production is strongly influenced by conditions of fermentation (quantity of initial SO<sub>2</sub>, temperature, type of yeast nutrition etc...).

## ↘ PRODUCTION OF ETHANAL

Ethanal is responsible for notes of flatness but is also the main element combining SO<sub>2</sub>, reducing the efficiency of sulphiting operations and consequently bringing about higher levels of SO<sub>2</sub>. It may be obtained by oxidation of wine but also by yeast metabolism.

## ↘ YEASTS AND MALOLACTIC FERMENTATION (MLF)

They have a fundamental influence on starting MLF, by capturing the nutritional elements essential to bacteria or producing metabolites which inhibit or stimulate bacterial growth. Many of our yeasts foster MLF in general, and more particularly coupled with certain selected bacteria.

## ↘ YSEO PROCESS

A new process for producing natural yeasts, it optimises the reliability of alcoholic fermentation and reduces the risks of olfactive defects due to fermentation (volatile acidity, sulphurous odours...). YSEO® yeasts are 100% natural and GMO-free.

## ↘ POF PHENOTYPE

Most yeasts have the ability to produce vinylphenols from coumaric acid and are said to be POF+. The joint use of enzymes with a cinnamoyl-esterase residual activity (therefore «producing» coumaric acid) and POF+ yeasts is liable to bring about concentrations that are too high in vinylphenols, leading to loss of aromatic freshness in white wines. Some of our yeasts do not have this capacity (they are known as POF-), and can be used to avoid this type of deviation.

## ↘ DEMALICATING POTENTIAL

Yeasts are able to bring about more or less strong malo-alcoholic fermentation, leading to partial deterioration of malic acid. Consequently, they may either reduce or preserve acidity.

# OENOLOGICAL PROPERTIES AND F

The behaviour of each yeast, at both sensory and kinetic levels, strongly depends on its environment (available nutrients, sugar concentration, must contamination...). In addition, although it varies depending on the conditions of the liquor, production of certain secondary metabolites (glycerol, SO<sub>2</sub>, ethanal...) is also determined by genetic heritage and/or the way the yeast is produced. IOC has developed a continuous programme for characterising its yeasts to guide users in their technical choices, tailored as closely to their requirements as possible.



	TYPE OF WINE	KILLER CHARACTER	TOLERANCE TO ALCOHOL
<b>IOC B 3000</b>	Whites	Sensitive	14 %
<b>IOC TWICE</b>	Whites	Killer	15,5 %
<b>IOC B 2000</b>	Whites Rosés	Killer	14 %
<b>IOC Révélation Thiols</b>	Whites Rosés	Killer	15 %
<b>IOC Fresh Rosé</b>	Rosés	Killer	16 %
<b>IOC Primrouge R 9001</b>	Reds	Sensible	14 %
<b>IOC R 9002</b>	Reds	Killer	15 %
<b>IOC R 9008</b>	Reds	Sensitive	16 %
<b>IOC Révélation Terroir</b>	Reds	Killer	15 %
<b>IOC 18-2007</b>	Traditional Method	Killer	15 % minimim
<b>IOC Divine</b>	Traditional Method	Sensitive	14 % minimim
<b>IOC Fizz</b>	Charmat Method	Killer	18 %
<b>IOC Fizz+</b>	Charmat Method	Killer	14 % minimim

# LINE CHARACTERISATION OF YEASTS

NITROGEN NEEDS	PRODUCTION OF VOLATILE ACIDITY	PRODUCTION OF GLYCEROL	FERMENTATION RATE	OTHER TECHNICAL FEATURES	
moderate	low	high	slow	• Facilitates MLF	• Low production of ethanal / SO <sub>2</sub>
high	low to moderate	nd	slow	• Facilitates MLF • Phenotype POF-	• Very low production of ethana / SO <sub>2</sub> • YSEO production process
low	very low	low	rapid	• Very short lag phase	
moderate	low	low	very rapid	• Suitable for very clarified musts	
moderate	low	low	rapid	• Very short lag phase	
high	very low	high	moderate	• Low production of ethanal / SO <sub>2</sub>	• Facilitates MLF • Phénotype POF-
high	very low	moderate	moderate	• Preserves acidity • Low production of SO <sub>2</sub>	
low	low	high	rapid	• Facilitates MLF • Phenotype POF-	• High fermentation power • Low production of SO <sub>2</sub>
high	low	moderate	moderate	• Low production of ethanal / SO <sub>2</sub>	• Slight demalivating potential • Facilitates MLF
low	low	moderate	very rapid	• High fermentation power • Very short lag phase	
low	moderate	high	moderate	• Suitable for fermentation activation	
low	low	moderate	rapid	• Very short lag phase • Phenotype POF-	
low	low to moderate	moderate	very rapid	• Slight demalivating potential • Phenotype POF-	

## FAQs

**O**n the contrary. The qualities that yeasts can confer on wines essentially depends on the intrinsic potential of the grape; yeasts just bring it out. The results for a given yeast will therefore be different from one must to another because they are linked to this potential.

«Doesn't using selected strains lead to standardising the taste of my wines?»

**C**ertain musts may be heavily contaminated with wild-type yeasts and this initial population jeopardises not only the proper establishment of active dry yeast but also the quality of the wine. For this reason, it is essential to add yeast as early as possible, from first vatting for reds that are filled in several steps, after settling for whites and rosés. This includes cold pre-fermentation, where risks remain high. Fractioned yeasting trials (5 g/hL at vatting then 15 g/hL after cold pre-fermentation maceration) or using a non *Saccharomyces cerevisiae* like Gaïa to protect, show good results in cases where it is difficult to maintain a low temperature.

«As a general rule, what is the right temperature for must when inoculation to ensure optimum establishment?»

Pre-fermentation bioprotection of musts and grapes by non-*Saccharomyces* yeasts can also be considered today to act even earlier without any untimely start-up in fermentation.

«When should yeasts be added to the must? Can I wait before inoculating in the pre-fermentation maceration?»

**Y**ou can inoculate without risk when the must temperature is above 8°C. Using the yeast protector is recommended, but what is essential above all is to acclimatise yeasts to the vat temperature by gradually adding must when rehydrating the starter culture.

«Is it worthwhile inoculating the same must with different yeasts?»

What is the right yeast dose?

**T**he suitable yeast dose depends on the conditions in the must. We recommend a minimum dose of 20 g/hL, which can be increased to 25-30 g/hL if the grapes are over-ripe and/or are microbially altered. A study has also shown that in 25% of cases, yeasts added at only 10 g/hL of juice did not get established.

It may be, particularly to take advantage of complementary specific activities. Nevertheless, to ensure a reliable result and not create inappropriate competition between yeasts, it is better to carry out a complete study into the dynamics of the different populations present. Many associations are actually antagonistic and result in the AF becoming stuck.