Réalisé en 2018, à l'échelle terrain :

1) A site with difficulty launching FML: what impact of nitrogen nutrition on BL activity?
2) FA → hot post-ferm maceration (30oC) - dismounting - pressing - intoning (duplicates))

Problematic FML plot

FA 200mg/L Total Nass after adjustment:
- Spontaneous FML

TOTAL FA 160mg/L Nass after adjustment:
- Spontaneous FML
- spontaneous FML - Lies 1%
- Spontaneous FML - LSI *Lies pasteurisées en fin FA*
- Spontaneous FML - Autolysats

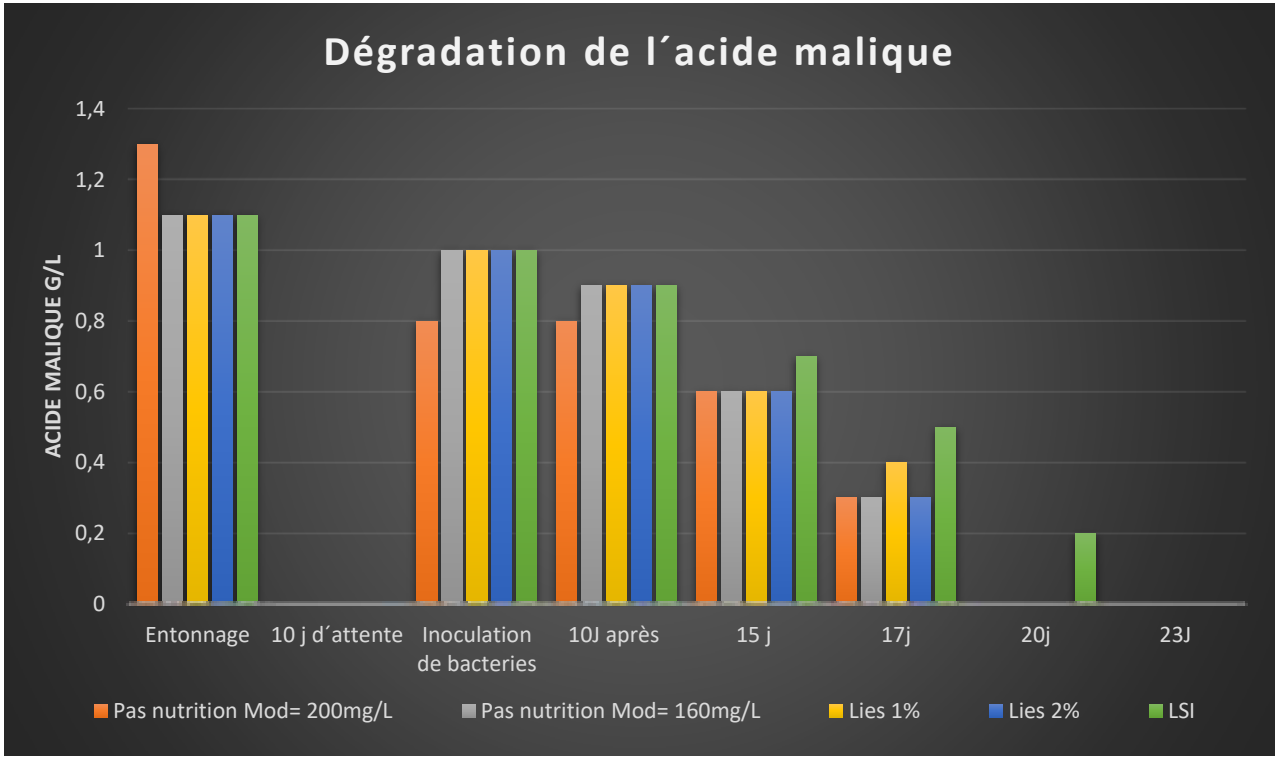
witness (assembly of 3 other plots)

TOTAL FA 160mg/L Nass after adjustment:
- Spontaneous FML

Conducted in 2018, on a field scale:

Analyses [malic acid]: after 10 days, very slight degradation.
Bacteria Count: 10 UFC/ml - normally a population of 10E6 UFC/ml

➔ Commercial bacteria inoculation



➔ no difference between the terms and conditions at the FML's unfolding
➔ except for 1 of the duplicates of the LSI modality, which took 3 more days to finish the FML
➔ Efficiency of LSI depends on the batches
➔

Conducted in 2018, on a field scale:

1) A site with difficulty launching FML: what impact of nitrogen nutrition on BL activity?
2) FA → macération post-ferm à chaud (30° C) → décuvage → pressurage → entonnage (duplic

➔ *no bacteria in initial batch, use of commercial strains*

Problematic FML plot

FA **200mg/L Nass total** after adjustment:
- FML ~~Spontaneous~~ commercial bacteria

TOTAL FA 160mg/L Nass after adjustment:
- FML commercial bacteria
- FML commercial bacteria + **Lees 1%**
- FML commercial bacteria + **LSI**
- FML commercial bacteria + ~~autolysats~~ **Lees 2%**

witness (assembly of 3 other plots)

FA **160mg/L Nass total** after adjustment :
- FML commercial bacteria - FML commercial bacteria + Activators

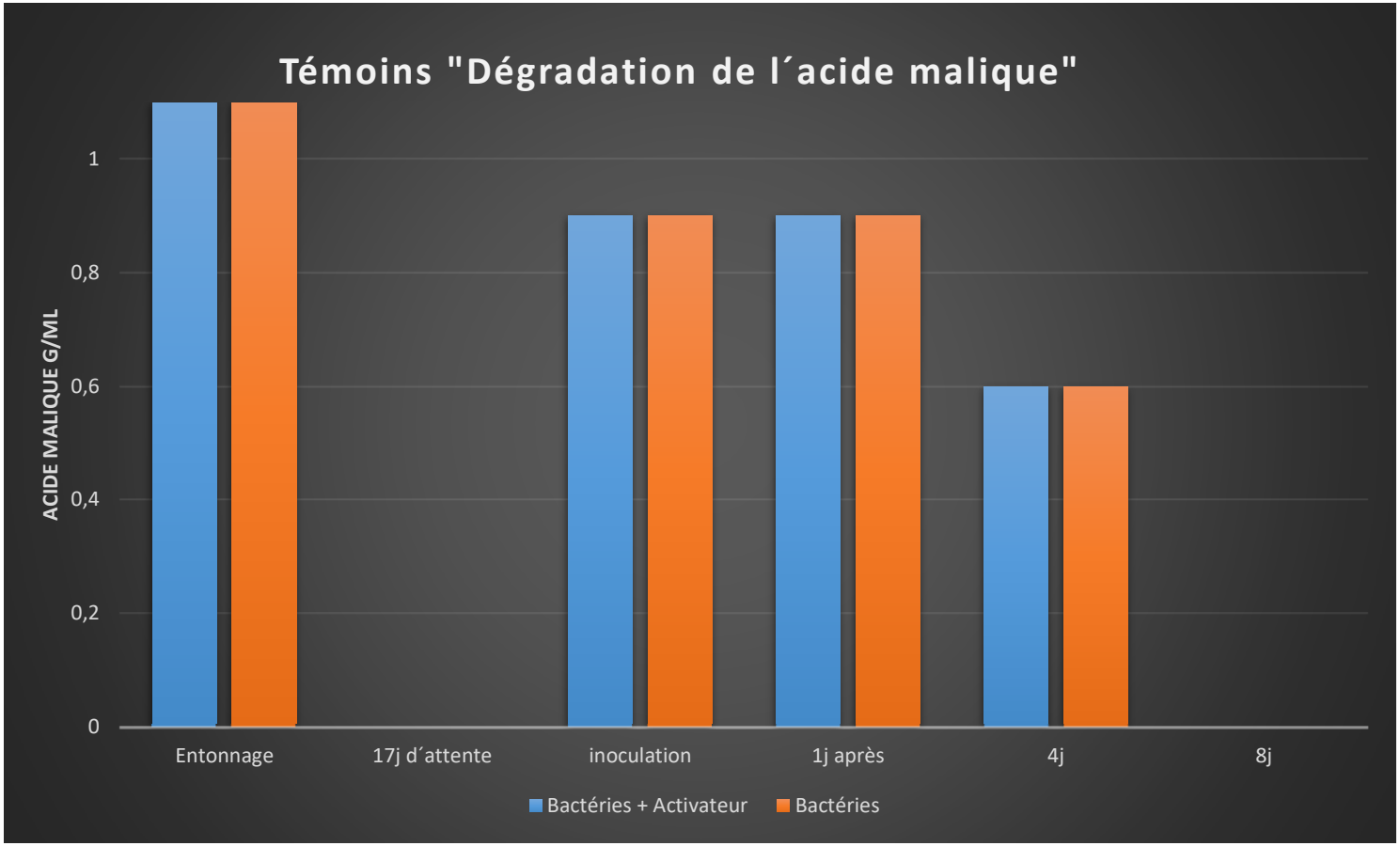
Conducted in 2018, on a field scale:

Chemical analyses at each stage of winemaking: no difference between terms and conditions

Fin FML	Modalité=200mg Nass/L		Modalité= 160 mg Nass/L							
Parametres	Pas de Nutrition	Pas de Nutrition	Pas de Nutrition	Pas de Nutrition	Lies 1%	Lies 1%	Lies 2%	Lies 2%	LSI	LSI
AV g/l	0.26	0.23	0.27	0.28	0.27	0.27	0.27	0.28	0.3	0.26
AT g/l	3.56	3.63	3.56	3.56	3.54	3.63	3.59	3.58	3.7	3.57
pH	3.57	3.55	3.61	3.61	3.6	3.62	3.61	3.61	3.6	3.61
Norg mg/l	49	48	42	41	41	42	41	42	42	42
Nmineral mg/l	0	0	0	0	0	0	0	0	0	0
SO2 Libre mg/l	< 5	<5	< 5	<5	<5	<5	<5	<5	< 5	< 5

Conducted in 2018, on a field scale:

Witness Results:
No difference with or without activator
FML lasted 8days to 20days for barrels test.



➔ No impact of nitrogen nutrition on problems on FML

Nutrition in FA has not been able to get BL native quantity sufficient to achieve FML - despite lack of SO2 on harvest -

seeding with commercial BL

➔ No difference between modality: logical because massive intake does not require nutrition.

2019 :

how to bring native bacteria to lots that do not?

2 tracks :

- ✓ Use N-1 year lot lees for which the FML worked. Stored for 1 year.
- ✓ Use N-year lot lees for which the FML has launched properly, with sufficient population level in BL.

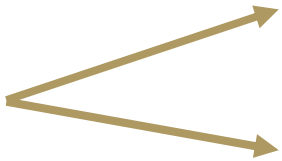
Prévu pour 2019 :

6 Duplicate modalities:

- Witness Plot: Spontaneous FML
-
- Test plot: spontaneous FML
-
- Test plot: FML with commercial BL
-
- Test plot: FML with PDC powered by BL native prests at the end FA of another batch
-
- Test plot: FML with PDC powered by BL native pdt FML pdt from another batch
-
- Test plot: FML with PDC powered by native BL from year n-1 lees from another property

2) A site with winemaking without added SO2

Cépage	Merlot
Récolte	1 out of 2
Vinification	No added sulphur In vats
Volume	100 hL/modality



witness : Spontaneous FML

Test : Spontaneous FML - 15 L lies 2017 preserved 4oC

FA over

1.6g/L of malic acid
0.6 g/L of lactic acid

FML Terms

2) A site with winemaking without added SO2

Lee analysis 2017:

Dénombrement de microorganismes par culture En UFC. mL^{-1}				
échantillon	Levures totales	Levures non-*Saccharomyces*	Bactéries acétiques	Bactéries lactiques
Lies A	5,0.10^{5}	Inférieur 10	Inférieur 10	1,3.10^{5}
Quantification de *Brettanomyces bruxellensis* (q-PCR) Equivalents UFC.mL^{-1}				
Lies A	Non détecté			

Analysis of lees 2017 in site at FML difficile:

Dénombrement de microorganismes par culture En UFC. mL^{-1}			
Levures totales	Levures non-*Saccharomyces*	Bactéries acétiques	Bactéries lactiques
4,6.10^{5}	1,0.10^{3}	Inférieur à 10	9,5.10^{2}

2) A site with winemaking without added SO2

	Acide malique (g/L)		Acide lactique (g/L)	
	cuve test	cuve témoin	cuve test	cuve témoin
18/10/2018	1,6	1,6	0,6	0,6
22/10/2018	<0,1	<0,1	1,3	1,3
27/10/2018	<0,1	<0,1	1,4	1,4

➔ No lees input influence on FML kinetics

2) A site with winemaking without added SO2

Dénombrement de microorganismes par culture En UFC. mL-1					
échantillon	stade	Levures totales	Levures non-*Saccharomyces*	Bactéries acétiques	Bactéries lactiques
Cassy Cuve 8	Fin FA avant ajout lies 18/10/18	$5,2.10^5$	$8,3.10^2$	20	$1,0.10^7$
	J+1 ajout lies 19/10/18	$5,8.10^5$	$5,9.10^2$	Inférieur à 10	$1,6.10^7$
Cassy Cuve 10	même lot cuve 8 18/10/18	$4,2.10^5$	$4,2.10^2$	Inférieur à 10	$8,5.10^6$
	J+1 19/10/18	$5,0.10^5$	$2,6.10^2$	Inférieur à 10	$9,6.10^6$

Test tank richer in yeast and bacteria than control tank: before and after adding lees

Echantillons	Stade	% de différence de LT	% de différence de Levures non sacch	% de différence de Bactéries acétiques	% de différence de Bactéries lactiques
Cuve 8 test	Avant ajout lies	+ 24%	+ 97%	> +100%	+ 16%
	J+1 ajout lies	+ 16 %	+ 127%	> +100%	+ 67%

➔ Adding lees appears to affect amount of BL despite higher initial count of the test tank compared to the control tank

➔

2019 :

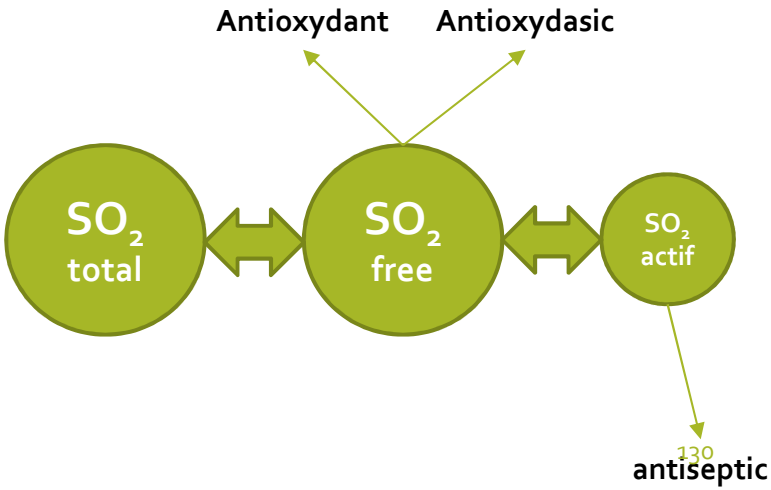
Outlook for 2019 :

1) PDC co-inoculation test with n-1 lees vs commercial bacteria
2) Identify the bacteria responsible for FML

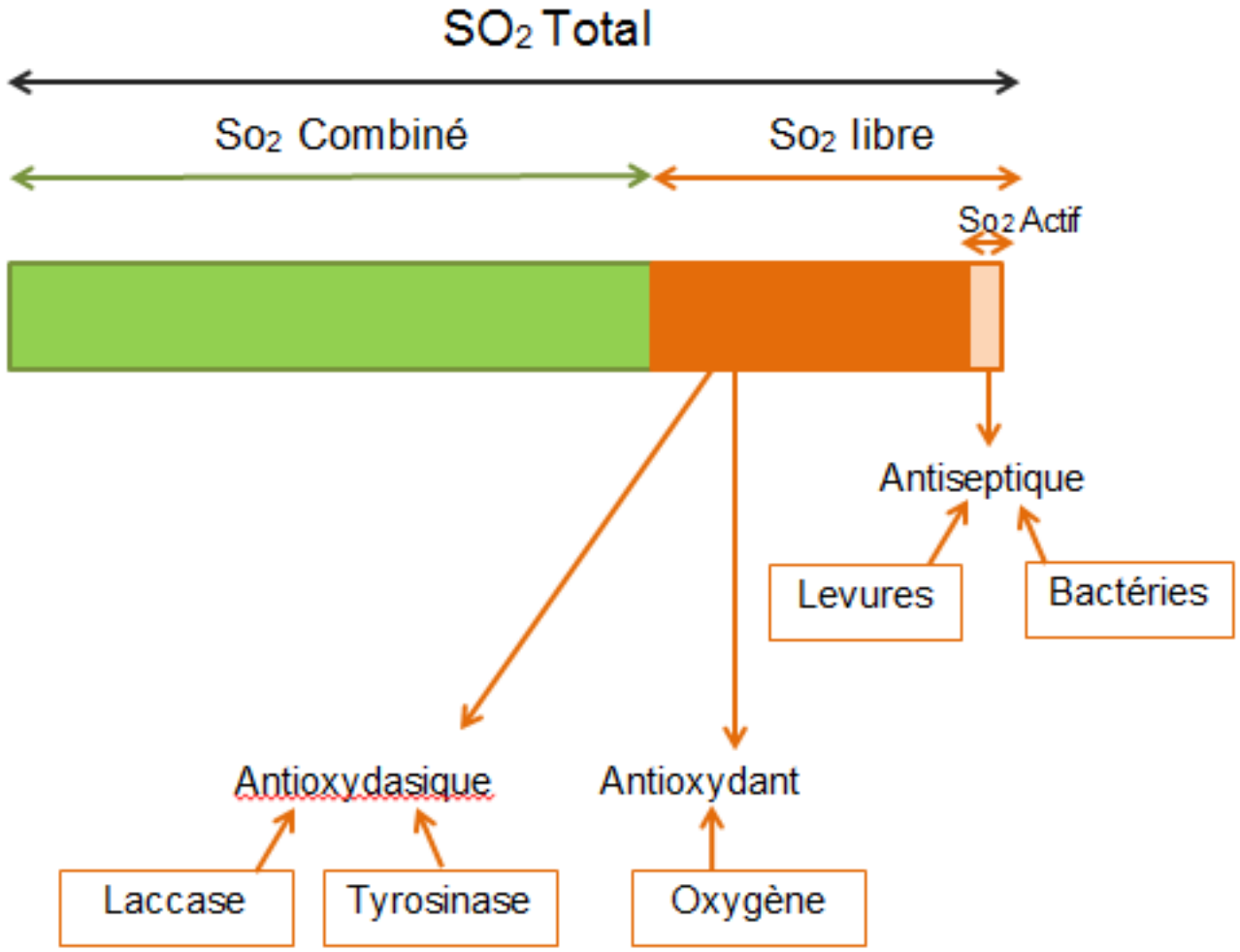
WINE WITOUT SO2

Role of sulphites in wine

- Broad spectrum of action
- Antioxydant
  - Antioxydasic
  - Microbiological stabilization
- Only a small part of the total SO2 is active
- MCO Recommendations: 0.7 mg/kg body weight



SULFITES ROLES IN THE Wine



WHITE WINE

Protection on oxidation:

- Different sensory profiles: terpene plus need (more sensitive to O2?) of O2 than thiol

RED WINE

Microbiological stability:

-Levurienne: Brettanomyces

-Bacterial: Acetic bacteria

Protection on oxidation:

- need <White Wine

On Aging

Protection against oxidation

Microbiological stability

Current context

Need SO_2

	Norme OCM Viticole	Vin Bio Europe
vins rouges < 2 g/L sucre	*150*	*100*
vins rouges entre 2g/L et 5g/L de sucre	*150*	*120*
vins rouges > 5g/L de sucre	*200*	*170*
vins blancs secs et rosés < 2 g/L	*200*	*150*
vins blancs et rosés entre 2g/L et 5g/L de sucre	*200*	*170*
vins blancs et rosés > 5g/L de sucre	*250*	*220*
vins mousseux : crémants < 2 et à plus de 5g/L de sucre	*150*	*120*
vins mousseux Qualité :< 2 et plus de 5g/L sucre	*185*	*155*
vins mousseux autres : cuve close… < 2 et à plus de 5g/L	*235*	*205*
vins moelleux/liquoreux peu botrytisès ou passerillés	*300*	*270*
vins liquoreux fort botrytis ou passerillage	*400*	*370*
vins blancs IGP de TAVT > 15% vol et > 45 g/L sucre	*300*	*270*
vins de liqueurs, moins de 2 g/L sucre	*150*	*100*
vins de liqueurs, plus de 2 g/L sucre	*200*	*170*
vins doux naturels	*200*	*170*

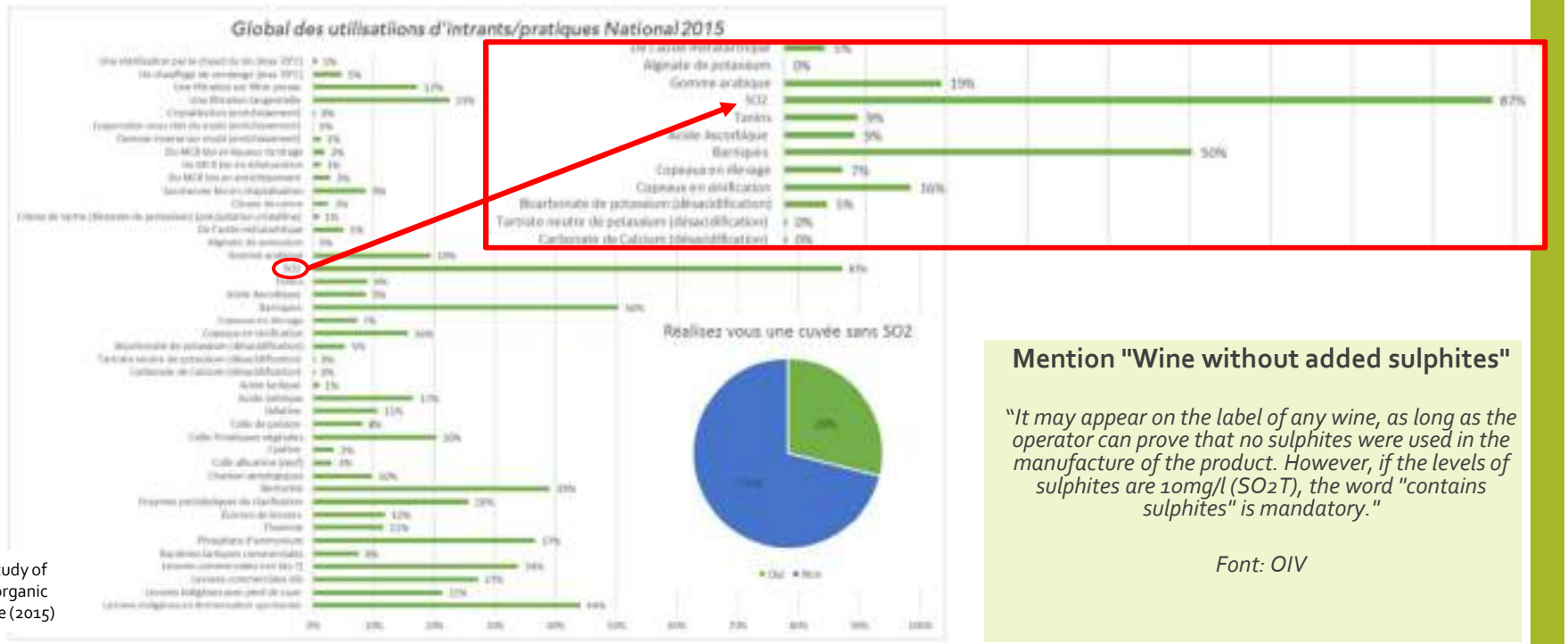
To date, no substance is able to completely replace the use of SO_2

- Broad spectrum of action
- Ease of use
- Low cost

Font: Organic Wine Regulations (RCE 203/2012)

Current context

Need SO_2



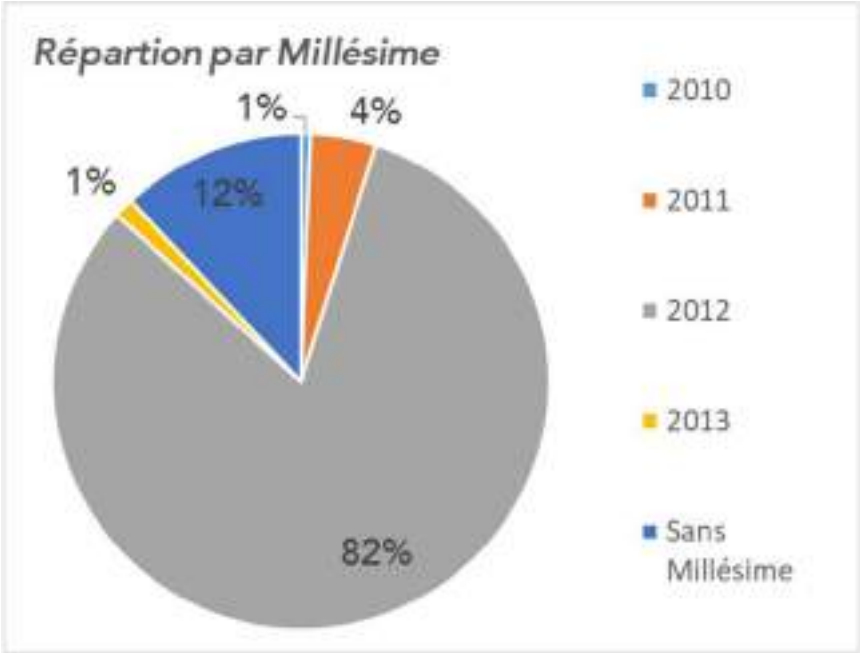
Font: ITAB - Study of SO_2 levels of organic wines in France (2015)

Mention "Wine without added sulphites"

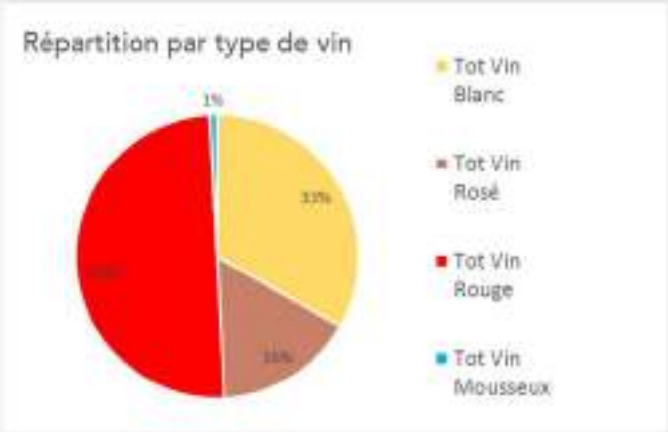
"It may appear on the label of any wine, as long as the operator can prove that no sulphites were used in the manufacture of the product. However, if the levels of sulphites are 10mg/l (SO_2T), the word "contains sulphites" is mandatory."

Font: OIV

Etude Itab sur les niveaux de SO2 dans les vins Bio

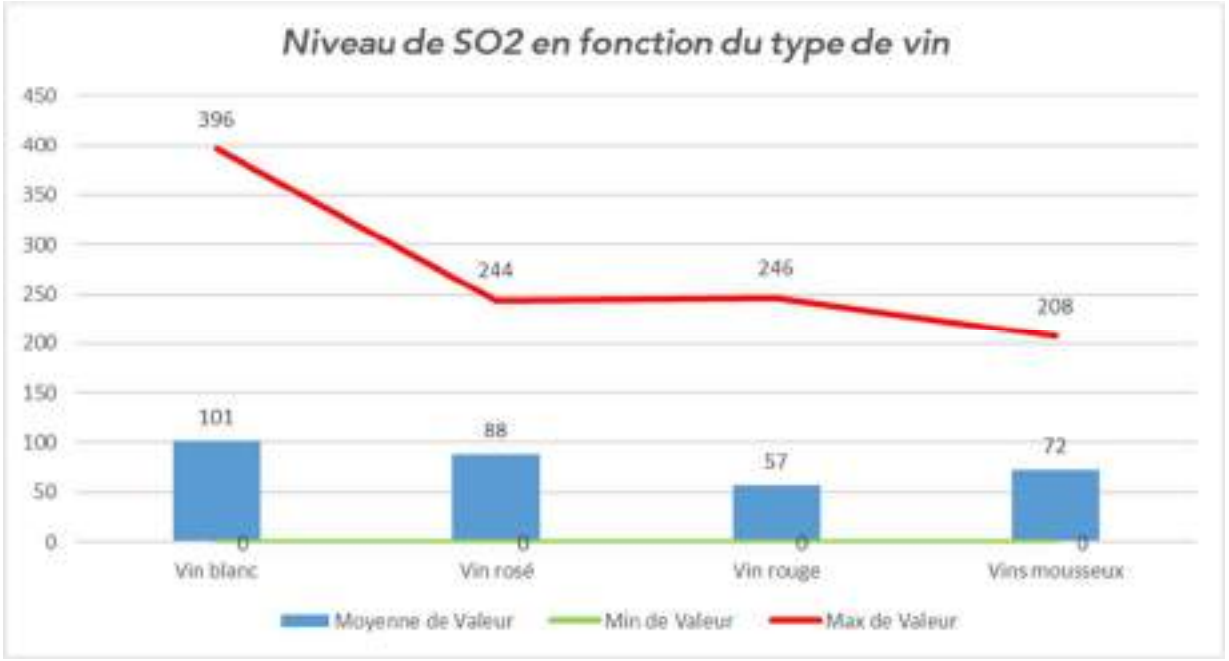


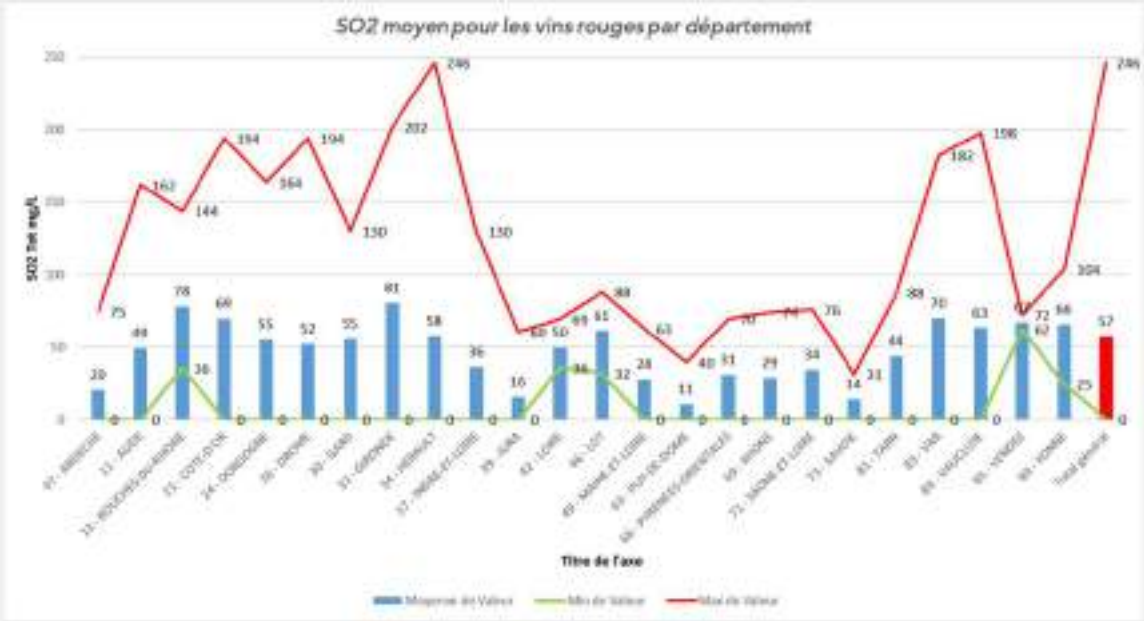
La base de donnée contient 1574 analyses de So2 total réalisées sur vin conditionnés

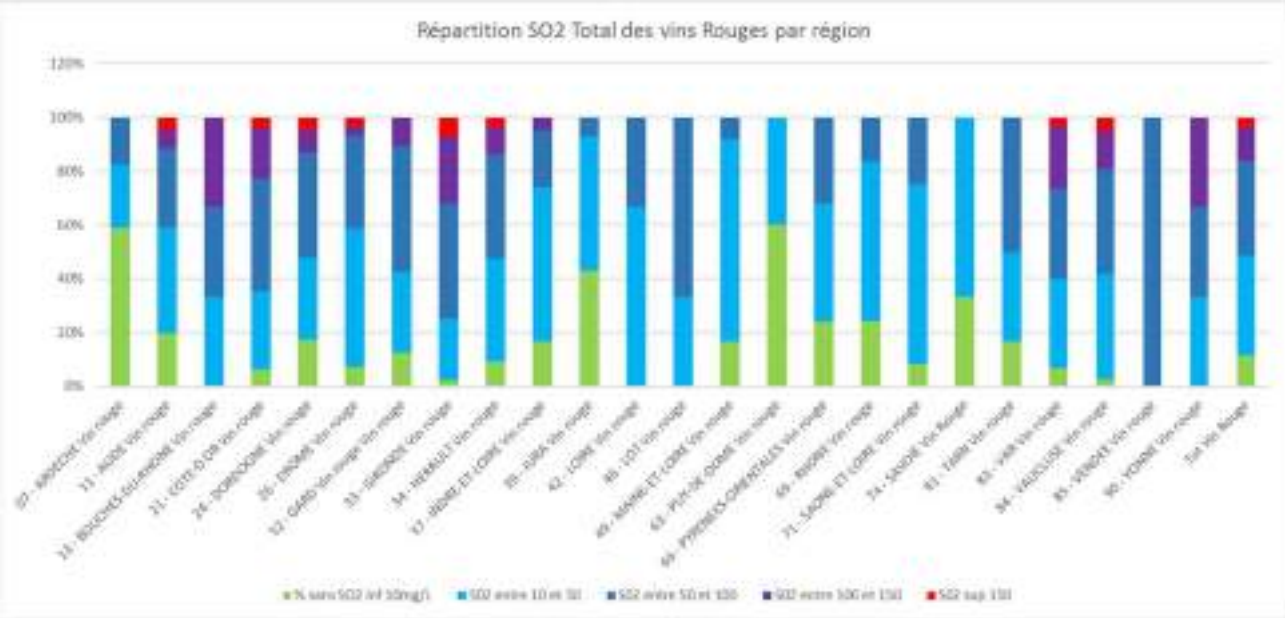


La base de donnée comporte principalement des vins rouges qui représentent la moitié de l'échantillonnage et des vins blancs.

Différence en fonction des couleurs




SO2 moyen pour les vins rouges par département
SO2 (en mg/L)
Titre de l'axe


Répartition SO2 Total des vins Rouges par région

SB1

PROJECT BIOPROTECTION

Diapositive 138

SB1 Stéphane BECQUET; 26/06/2019

The principle of Bio-protection

concept

Aureobasidium
Cryptococcus
Rhodotorula
Rhodosporidium
Candida
…

…
Candida
Pichia
Hanseniaspora
Metschnikowia
Torulaspora
Saccharomyces
Brettanomyces
…

Font: M. Bely

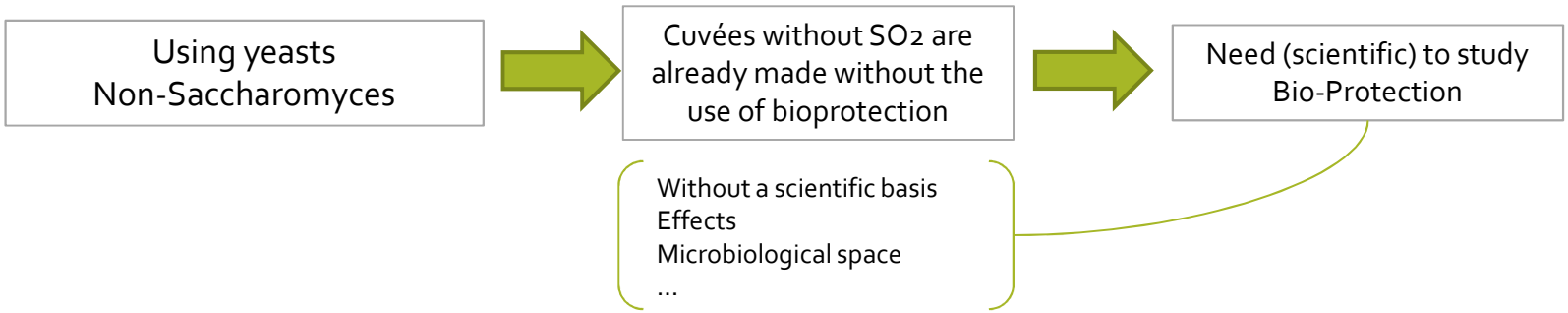
Objectif: occupy the environment (must) quickly for competitors and avoid the development of undesirable organisms

(Many Non-Sacc and bacteria are harmful to the quality of wine)

The principle of Bio-protection

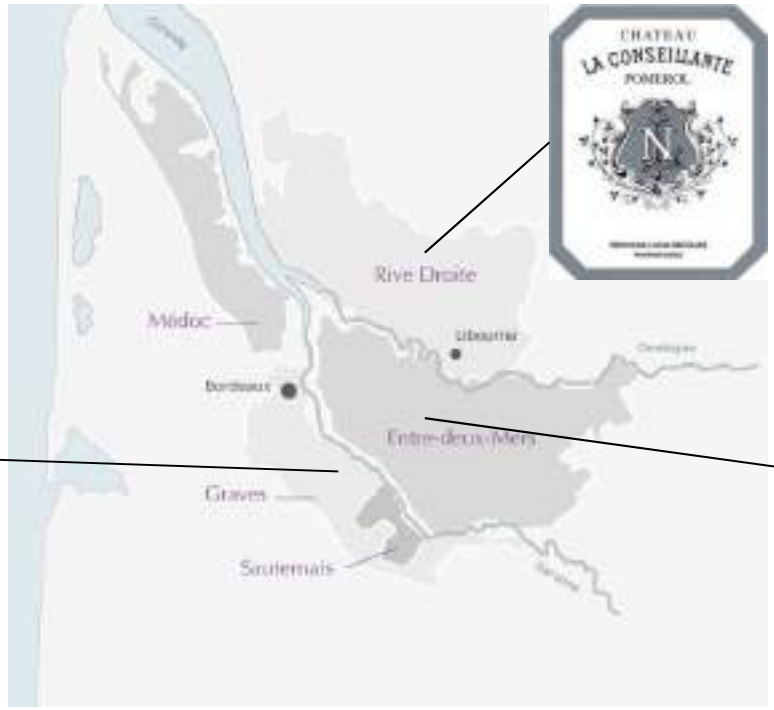
concept

- More and more information about non-Saccharomyces yeasts and its benefits
- At the level of Bio-protection there is little scientific information (commercial info)



Project organization

Participating Estates Field trials



CHÂTEAU CARBONNIEUX

PESSAC-LEOGNAN

Grand Cru Classé de Graves

CHATEAU LA CONSEILLANTE POMEROL

Vignoble Bordon

Organisation du projet

Institutions

Expertise scientifique Transfert scientifique Qualité des vins	Expertise Terrain Œnologie bio	Partie analyse Transfert scientifique

PROJECT BIOPROTECTION

- Evaluation of the impact and effectiveness of BioProtection in order to vinify wines without SO2 in the pre-fermentary phase.
  - Impact on the occupation of microbiological space
  - Impact on the oxidation of musts and wines
  - Impact on the FA
  - Impact on lactic bacteria populations and FMLs

RÉGION Nouvelle-Aquitaine

VBNA
VIGNERONS BIO NOUVELLE AQUITAINE

CHÂTEAU CARBONNIEUX
PESSAC-LEOGNAN
Grand Cru Classé de Graves

CHÂTEAU LA CONSEILLANTE
POMEROL

Vignoble Laudoy

ISVV
INSTITUT DES SCIENCES DE LA VIGNE ET DU VIN
BORDEAUX AQUITAINE

MICROFLORA
L'EXPERTISE EN MICROBIOLOGIE

Project organization

Vinifications laboratory

	Microvinification ISVV
	White wine
Grape variety	Sauvignon Blanc
Modality	2 x -Sulfitage 5gr/Hl -5gr/HL Primaflora VB before pressing / -Zero addition -5gr/HL Zymaflore X5 before pressing
Fa	4.5L mini tank
yeast	Zymaflora X5 20gr/Hl

Project organization

Winemakingons on the ground

	Château La Conseillante	Château Carbonnieux	Château du Bourdieu	
	Vin rouge	Vin blanc	Vin blanc	Vin rouge
Grape variety	Merlot	Sauvignon Blanc	Sauv. Gris	Merlot
Modality	2 x -Sulfitage 3 g/Hl -5gr/HL Primaflora VB on must -Zero addition -LSA	2 x -Sulfitage 5gr/Hl -5gr/HL Primaflora VB before pressing -Zero addition -5gr/HL Zymaflore X5 before pressing	1 x -Sulfitage 5gr/Hl -5gr/HL Primaflora VB on must	1 x -Sulfitage 3gr/Hl -5gr/HL Primaflora VR on must
Fa	8 Barrels 400 hl	8 Barrels (250L)	2 Cement tanks 60 Hl	2 stainless steel tanks 110 Hl
yeast	Excellence XR 15 gr/HL	Zymaflora X5 20 gr/Hl	Zymaf. X5 20gr/Hl	Fermol Rouge à 15 gr/Hl

Project organization

Picking points

	Blanc	Rouge
1	Pressurage	Encuvage après homogénéisation
2	Après débourbage	Jour+2
3	Début-FA	Début-FA
4	Mid-FA	Mid-FA
5	Fin-FA	Fin-FA

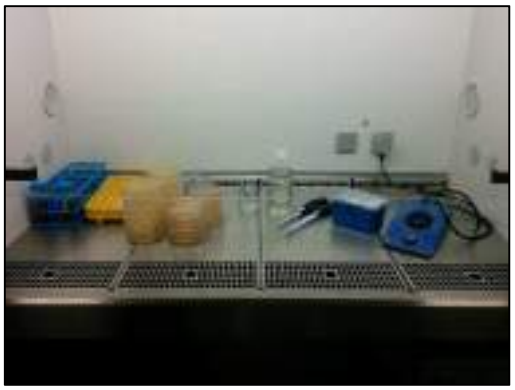
Project organization

Yeast cultivation and colony counting

Chaque échantillon…

- 3x Different Dilutions
- 5x Different environments to select and amplify a particular part of colonies
  - NS, NSA, NSB: Non-Saccharomyces
  - LT: Total Yeasts
  - BA, BL: Acetic and Lactic Bacteria

300 culture/Estate boxes



Project organization

Implantation control

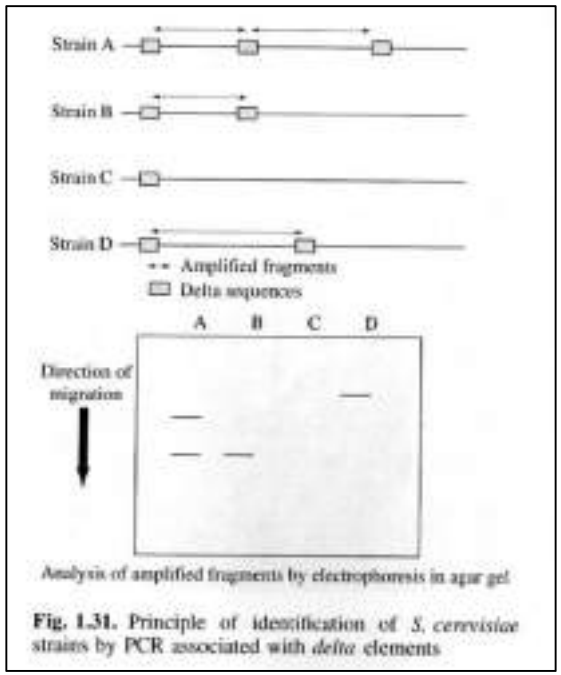


Fig. 1.31. Principle of identification of *S. cerevisiae* strains by PCR associated with *delta* elements

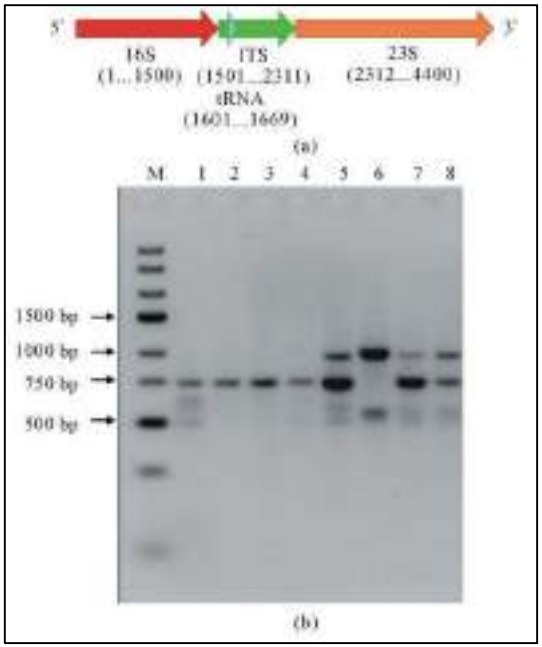
Objective: to find out if the correct strain of S. cerevisiae has implanted

PCR-delta - differentiation strains Saccharomyces cerevisiae (delta regions)

- Selection 10 UFC
- Medium: LT (Total Yeasts)
- Stadium: 4 (Mid-FA)
- Witness: LSA levurage

Project organization

Species identification



Objective: to know the microbiological diversity of must (species)

PCR-ITS « *Internal Transcribed Transfer* »→ differentiation species of yeasts (amplification rDNA)

- Selection 30 UFC
- Midfielders: LT (Total Yeasts) and NS (Non-Saccharomyces)
- Stadiums: 1-3 (Preferred Phases)

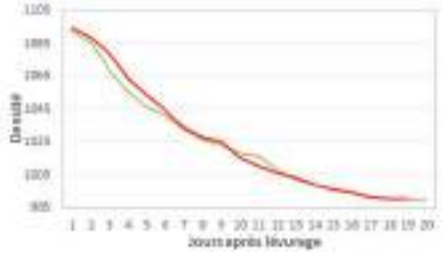
a) Schematic representation of the position of ITS region in between 16S and 23S rDNA gene region; (b) PCR amplification of internal transcribed spacer (ITS) region from diverse isolates. Font: Singh, V. (2012)

RÉSULTATS

Fermentations

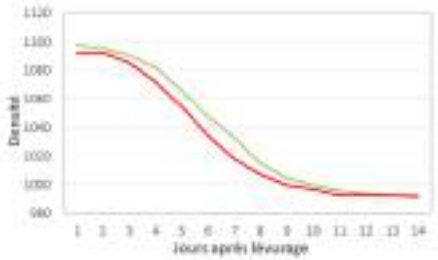
Domaine du Bourdieu Blanc

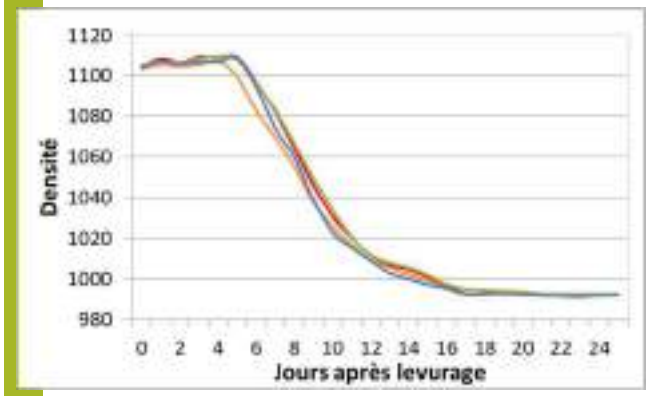
	TAV	AM
BioProtection moût	13,6	2,2
Sulfitage	13,4	2,6



Domaine du Bourdieu Rouge

	TAV
BioProtection moût	13,8
Sulfitage	13,9

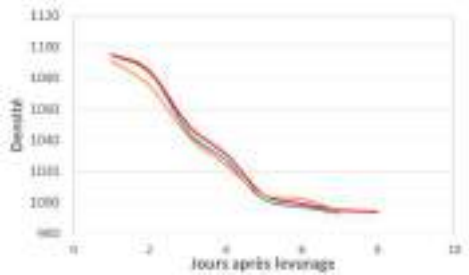




Château La Conseillante

	TAV	pH	IPT
0 ajouts	14,9	3,59	86
BioProtection moût	14,805	3,555	90,5
LSA XR	14,9	3,58	88,5
Sulfitage	14,91	3,51	87,5

Château Carbonnieux



	TAV	pH	AM
0 ajouts	13,54	3,38	2,1
BioProtection moût	14,8	3,41	2,1
LSA X5	14,14	3,4	2,1
Sulfitage	14,13	3,36	2,3

Overall we do not see a large variation in fermentation curves between the different modalities.

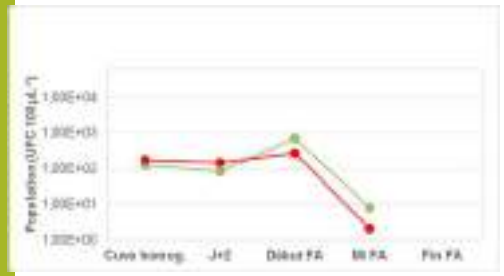
In terms of chemical analyses at Château Carbonnieux there is a great variation in degrees and a very high degree for the Bioprotection modality.

Château The Council shows an earlier start of the LSA XR modality and a slow start of bioprotection

Acetic bacteria

	AV
BioProtection moût	0,52
Sulfitage	0,40

Domaine du Bourdieu Blanc



Domaine du Bourdieu Rouge

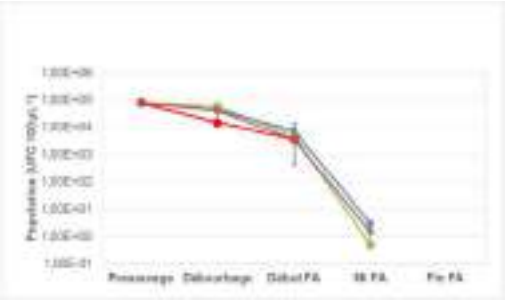
	AV
BioProtection moût	0,33
Sulfitage	0,34

	AT	AV
0 ajouts	4,18	0,24
BioProtection moût	4,05	0,19
LSA X5	4,1	0,19
Sulfitage	4,13	0,13

In terms of volatile acidities the values are correct. The BioProtection must modality of the Domaine du Bourdieu Blanc shows higher volatile acidities. The explanation for the upturn probably comes from the slowdown of the FA observed on the fermentation curve.

At The Carbonnieux castle the sulphite-free modality has a significantly higher acetic bacterium level (early FA stage) the other modalities are identical

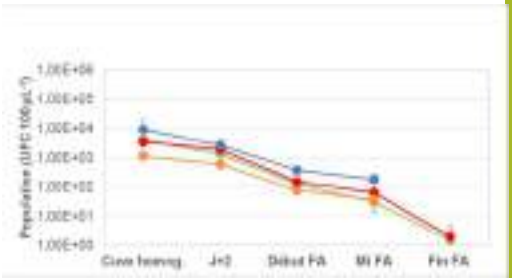
At Château La Conseillante the volatile acidities are quite close and the modality with no addition sets better results than the others. LSA modality with the highest volatile. This is confirmed by a significantly higher population on modality zero addition to J-2 while the other modalities are in similar levels



Château Carbonnieux

	AT	AV
0 ajouts	4,55	0,280
BioProtection moût	4,75	0,345
LSA XR	4,45	0,355
Sulfitage	4,75	0,315

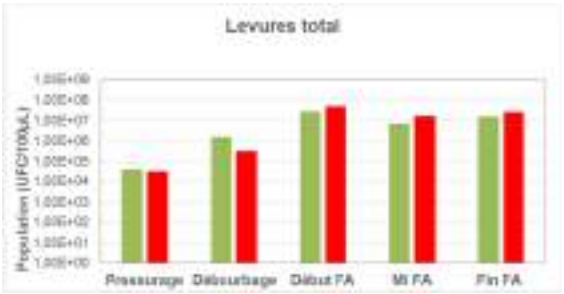
Château La Conseillante



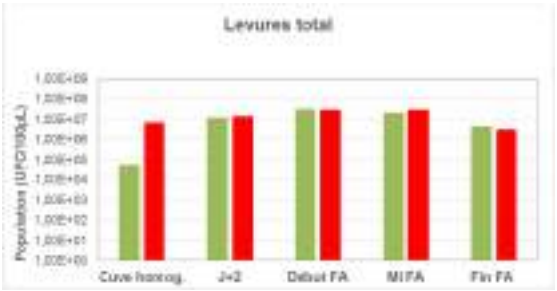
Microbiological counting

Château Carbonnieux

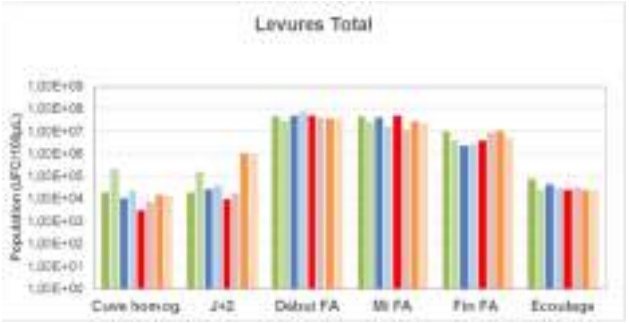
Domaine du Bourdieu Blanc



Domaine du Bourdieu Rouge



Château La Conseillante



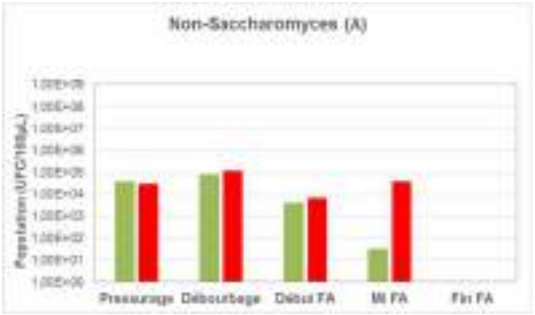
There are very different population levels between white and red. This seems logical the whites are more homogeneous because it is in liquid phase while the reds are in solid phase.

The sulphate modalities undergo a decrease in total yeasts which makes sense and the LSA modalities a faster increase due to an earlier implantation of saccharomyces more suitable for the environment

Non Saccharomyces

For the Dubourdieu domain the evolution of reds is normal with a gradual decrease in non saccharomyces. We note the very good behaviors of the non-sacharomyces yeast of bioprotection with a population that increases more and decreases over time to let the saccharomyces do the fermentation.
The case of whites is more delicate for white sulphides or non-saccharomyces stays longer and at high levels. (Yet it is this modality that has the lowest VA)

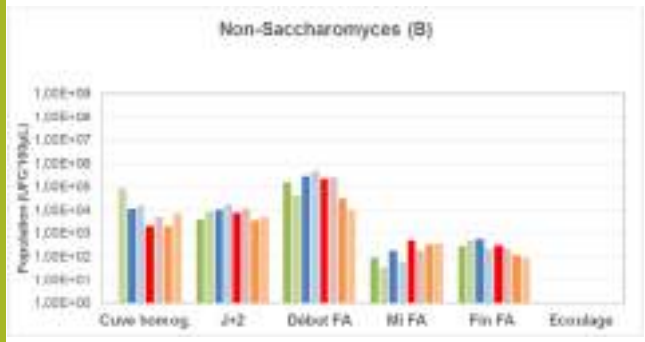
Domaine du Bourdieu Blanc



Domaine du Bourdieu Rouge

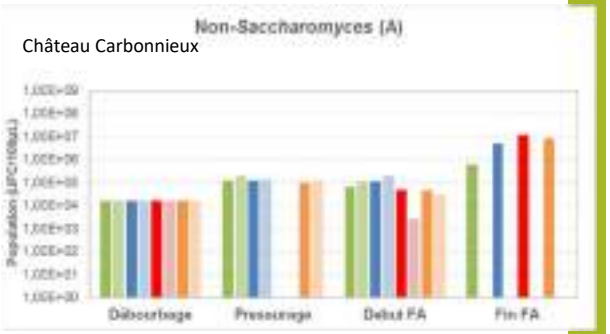
The population levels at Château Carbonnieux are homogeneous from working on white wine and therefore on juice
The progression of non-saccharomyces in Bioprotection mode despite seeding remains low
No population differences related to the addition of Primaflora Bioprotection or LSA X5 on NS environment
Rem
The FA's zero and end pressing data corresponds to the fact that the analysis could not be performed

Château La Conseillante

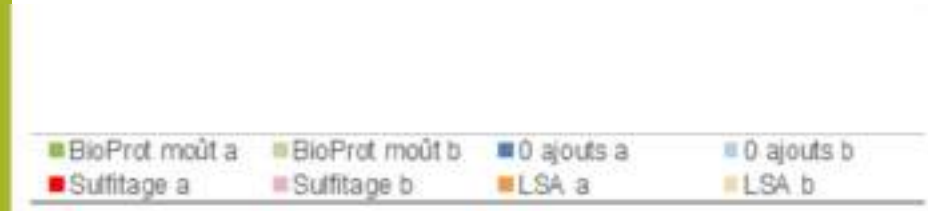


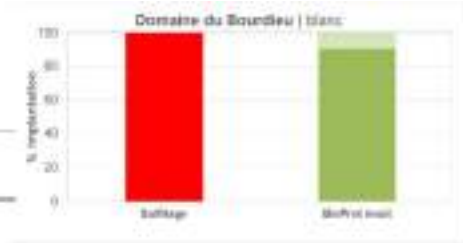
A la Conseillante
The implantation of non-saccharomyces in bioprotection modality seems good with higher levels.
The results of the microbiological count show a significant effect on non-Saccharomyces population at the beginning FA in the modalities Bioprotection and LSA XR.
On the other hand we find higher populations for the modalities zero additions and sulphite during fermentation.

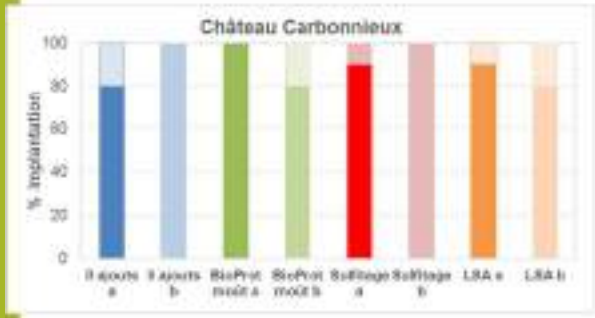
Château Carbonnieux



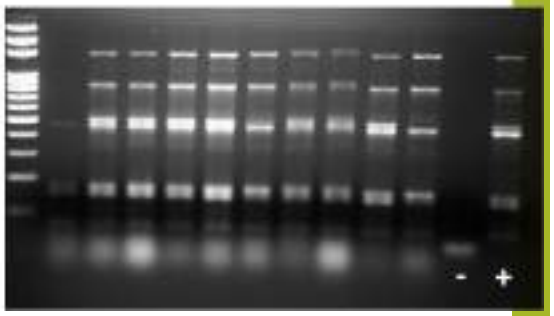
Implantation control

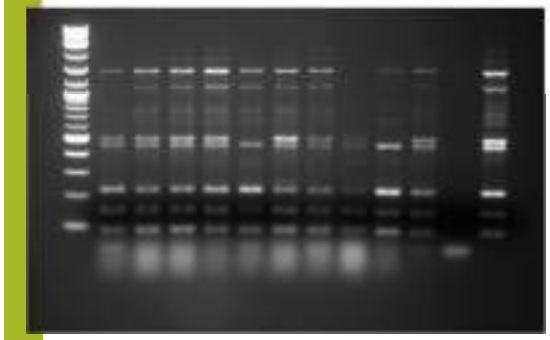






Overall we see a good implantation of the strain of Saccharomyces cerevisiae inoculated by levurage.

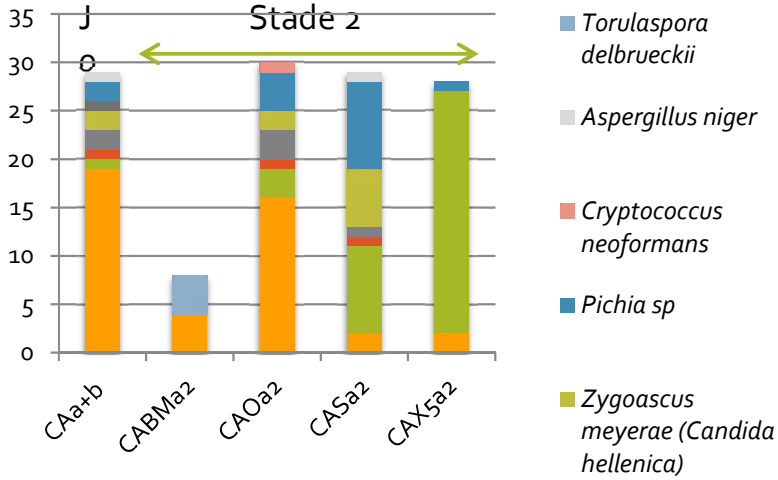


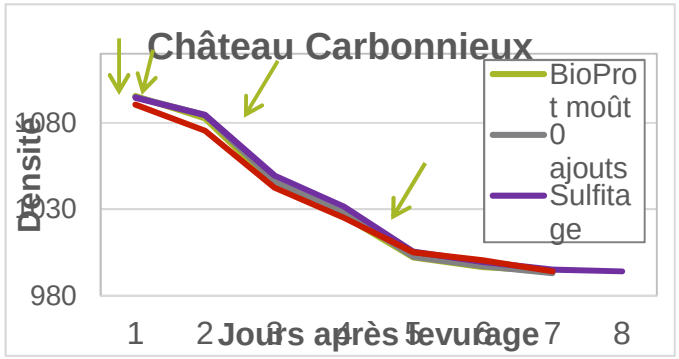


La Conseillante :
Poor implantation on the 2 repetitions of the bio protection modality This explains the delay in starting the fermentation that we found.
The explanation probably comes in part to the presence of a mixture sach/non sach in the bioprotection. The saccharomyces present in bioprotection that disturbed the sacharomyces used for fermentation

Analysis of isolated colonies on LT; PCR/ITS/Sequencing samples incuvage

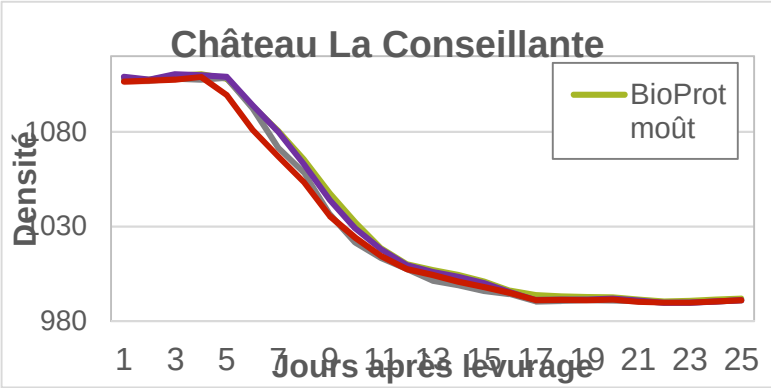
	Blanc
1	Pressurage
2	Après débourbage
3	Début-FA
4	Mi-FA
5	Fin-FA



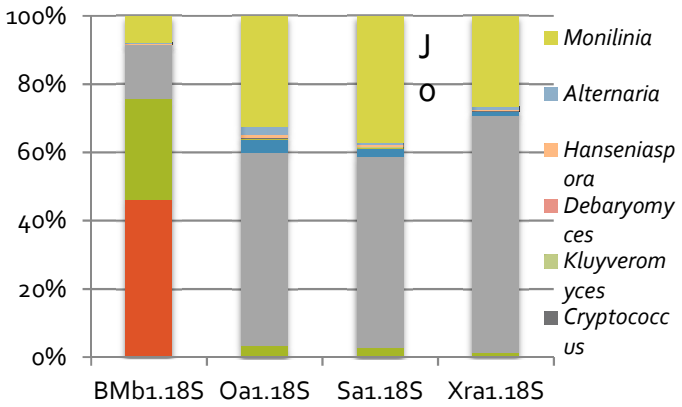


Modality BM: too few colonies analyzed, but 50% of colonies are identified as Torulaspora
"Sulphate" terms: the addition of SO_2 favours Saccharomyces
"Bioprotection X5" mode: Saccharomyces is the majority
The presence of H. uvarum is limited with the addition of SO_2 or X5.

MiSeq ADNr 16S and 18S analysis on incuvating samples

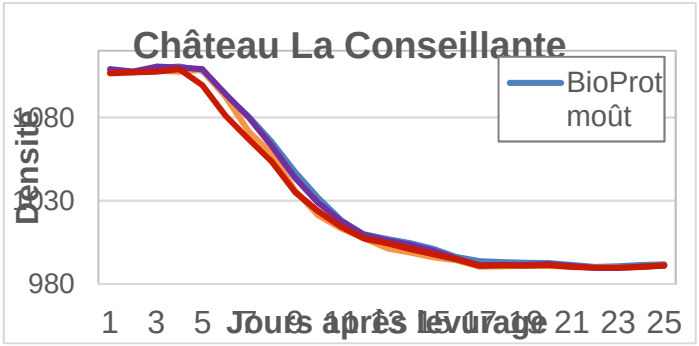


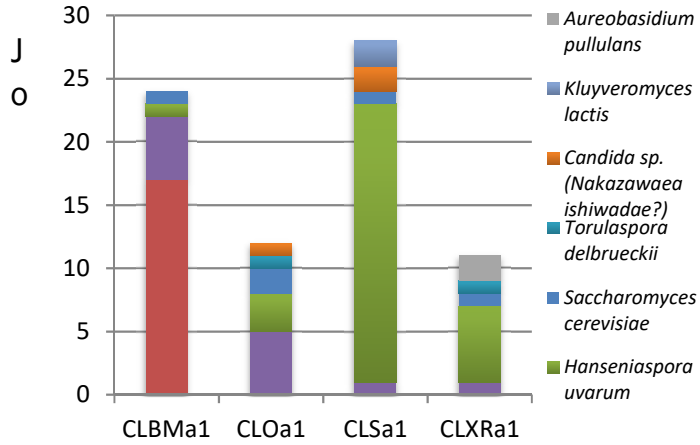
Rouge	
Encuvage après homog.	J 0
Jour + 2	J+3
Début-FA	J+6
Mi-FA	J+10
Fin-FA	J+17
	J+21



As expected, Metschnikowia and S. cerevisiae are present in the bioprotection modality and occupies the niche.

Analysis of isolated colonies on LT; PCR/ITS/Sequencing samples incuvage



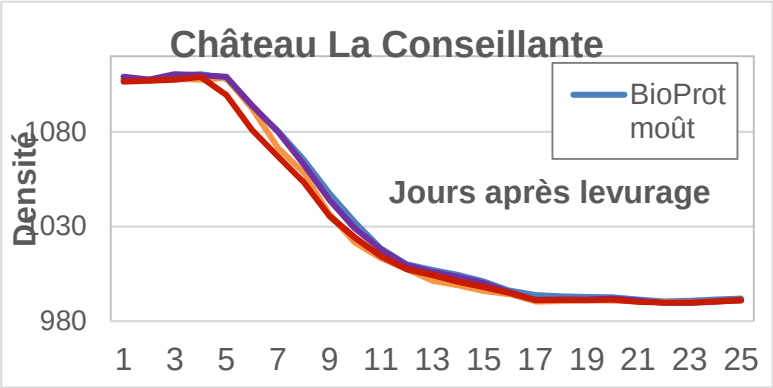


Rouge
Encuvage après homog.
Jour + 2
Début-FA
Mi-FA
Fin-FA

J 0
J+3
J+6
J+1
0
J+1
7
J+2
1

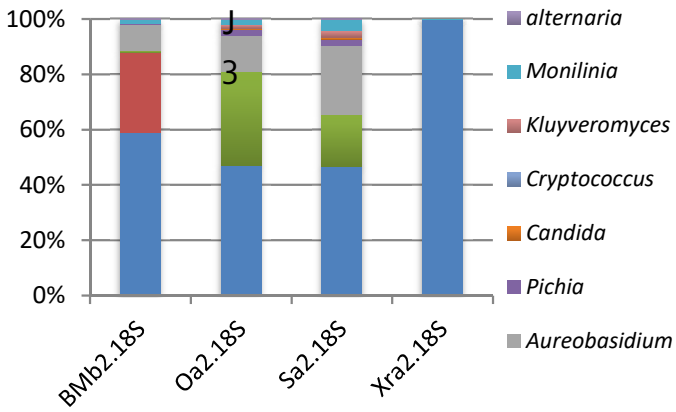
As expected, and in agreement with the sequencing data, Metschnikowia and is present in the modality "bioprotection" and occupies the niche, but Saccharomyces is not found.
H. uvarum is dominant in the "sulphite" and "XR" bioprotection modality

MiSeq ADNr 16S and 18S sample analysis Day 2



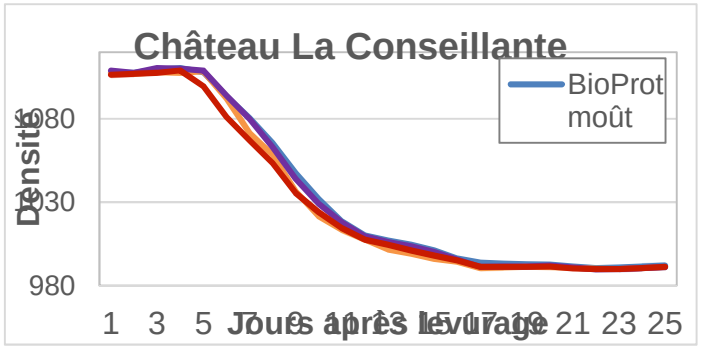
Rouge
Encuvage après homog.
Jour + 2
Début-FA
Mi-FA
Fin-FA

J 0
J+3
J+6
J+10
J+17
J+21



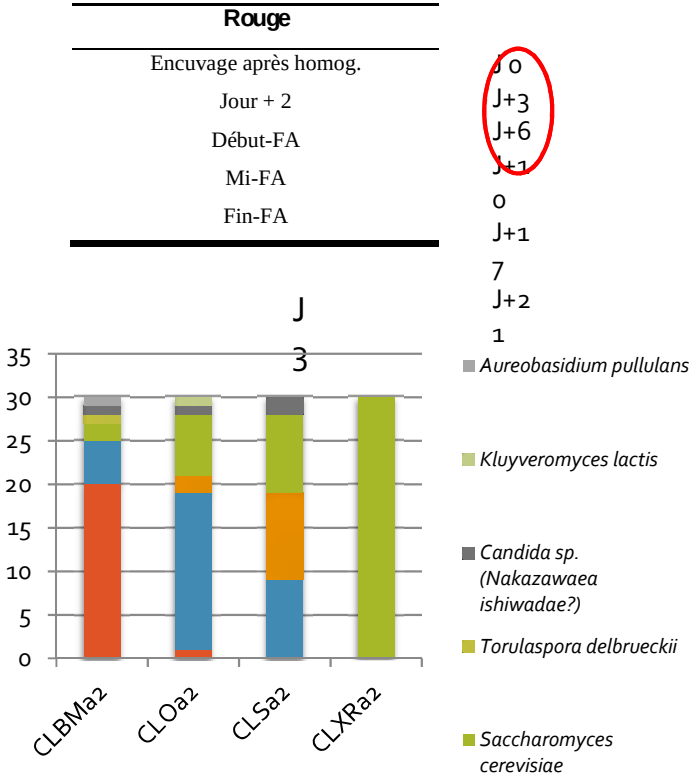
After 2 days of cold prefermentary maceration, S. cerevisiae is present, and even dominant in the bioprotection modality "XR"; fermentation starts faster (see density curves)

Analysis of isolated colonies on LT; PCR/ITS/Sample Sequencing Day 2



After 2 days of cold prefermentary maceration, S. cerevisiae is present, and even dominant in the bioprotection modality "XR"; fermentation starts faster (see density curves)

Metschnikowia is still present in the modality 'bioprotection Primaflora »



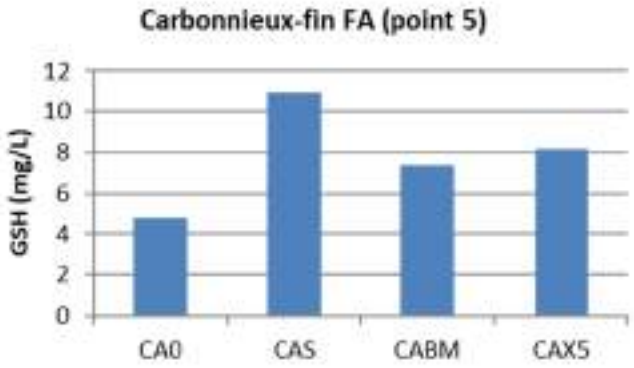
Chemical analyses

Chemical analysis, white

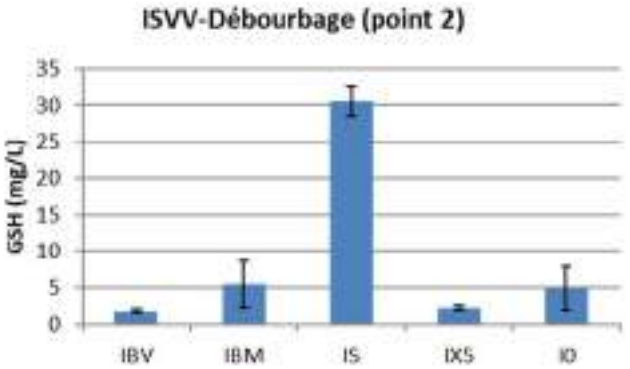
Glutathione (GSH), a marker of the oxidation of musts and wines, was analysed at the end of fermentation and at the end of fermentation for the trials conducted at the ISVV and Château Carbonnieux.

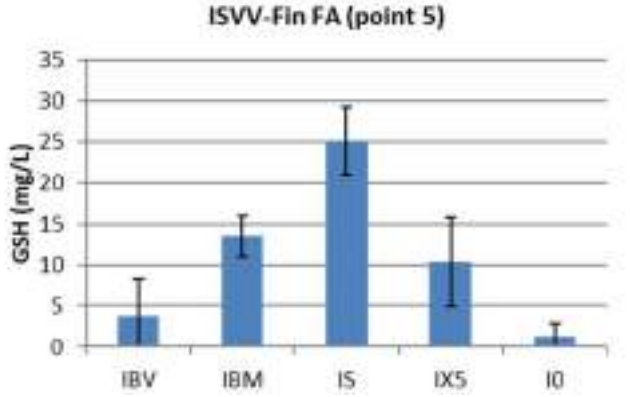
At unbreak, a large amount of glutathione is lost with or without Bioprotection. The sulphate modality has significantly higher levels of GSH compared to other modalities for both experiments.

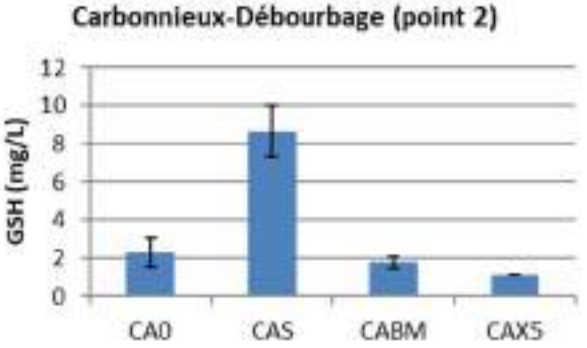
At the end of fermentation, the high GSH levels for Bioprotection modalities seem to show the positive role of Bioprotection in the conservation or release of GSH.

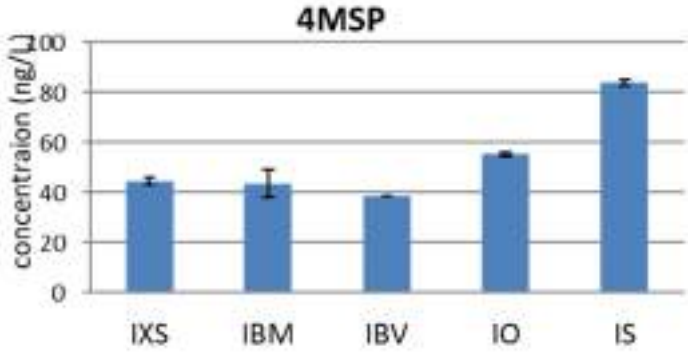


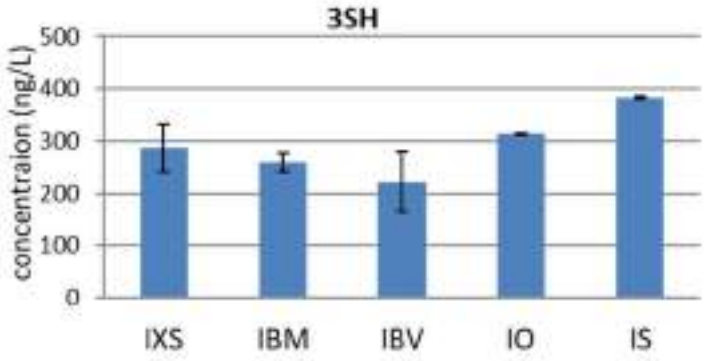
Volatile Thiols; example ISVV











Chemical analysis, white

Volatile thiols, markers of the aromatic typicity of Sauvignon Blanc, were dosed at the end of fermentation for the trials conducted at ISVV and Château Carbonnieux.

The sulphate modality has significantly higher levels of volatile thiols compared to other modalities. Regardless of the experimentation, the levels of volatile thiols are impacted identically in the absence of SO2 and in the presence or not of Bioprotection.

Dégustation

Triangular tests were carried out on 2 tastings to see if the modalities could be distinguished between them.

Domaine du Bourdieu Blanc

Test triangulaires:
Modalités B/S, test significatif .

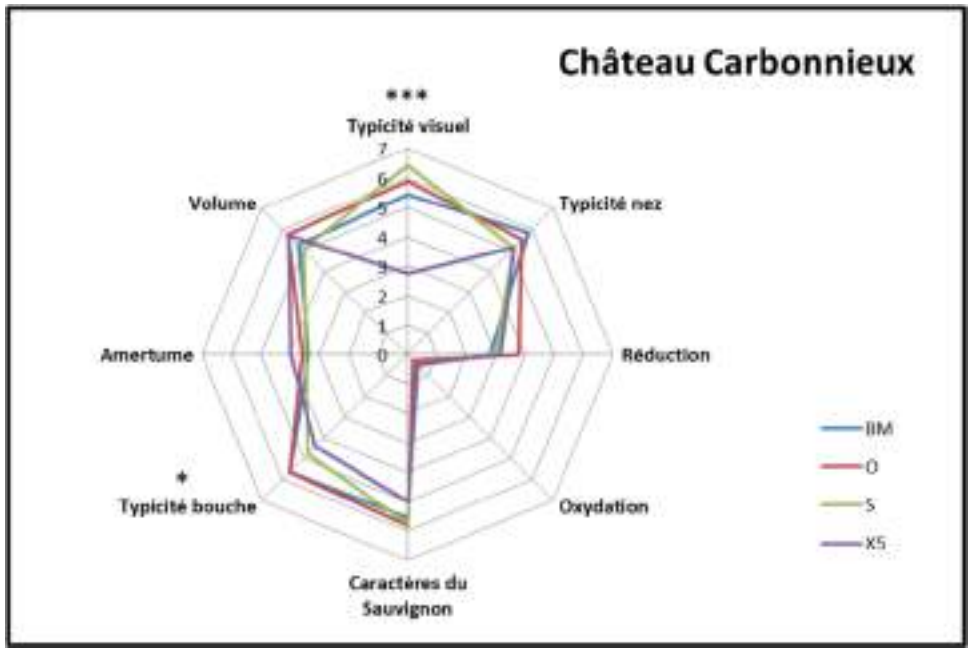
Domaine du Bourdieu Rouge

Triangular test:
B/S terms, no significant differences.

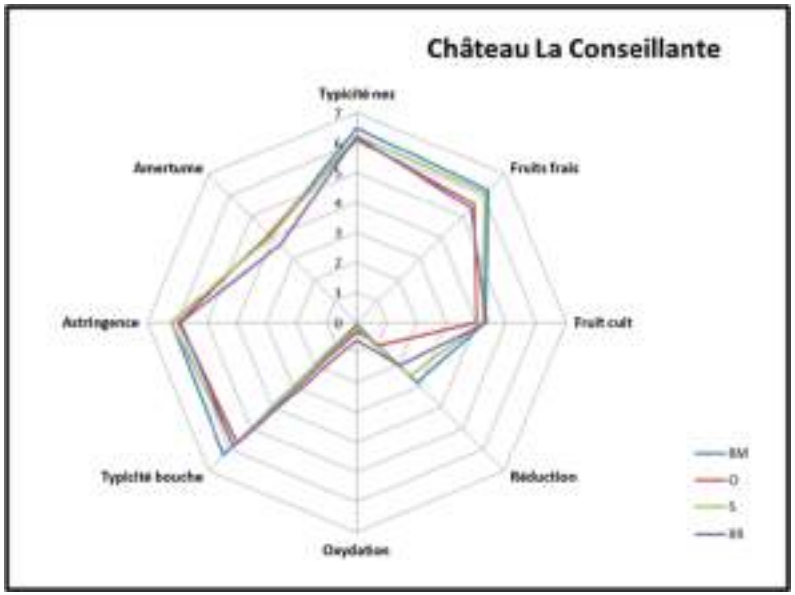
At Domaine du Bourdieu, triangular tests show significant differences between the sulphite modality and the BioProtection modality for white wine.
On Red wine, we do not find any significant differences between the two modalities.

Château Carbonnieux

At Château Carbonnieux, the sulphite modality being very small, it is difficult to conclude as to the distinction of blind samples.
With regard to aromatic profiles, only the "visual" and "e mouth" criteria are significantly different, with the "e" modality being better evaluated for visual typicity, while the sulphite-free modality is better rated for typic it mouth.



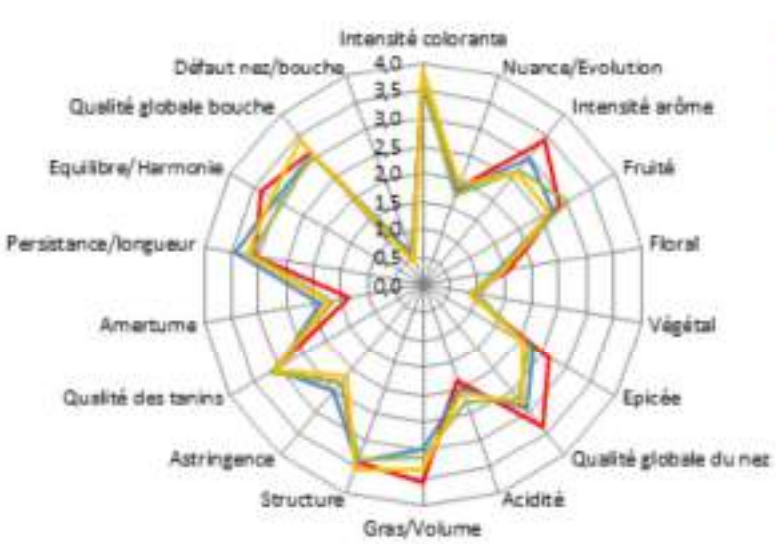
Château La Conseillante



Significant differences are obtained between the Bioprotection and Sulphate modalities, but the number of tasters preferring either modality is the same.
No significant differences are shown for the criteria assessed with the profiles.

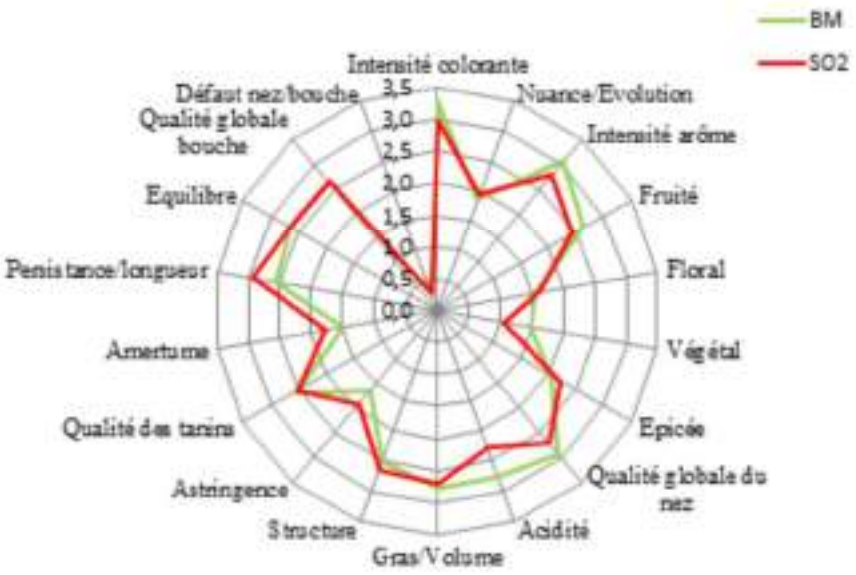
Results of the tasting Technical Commission Vignerons Bio New Aquitaine

Château La Conseillante



For Château La Conseillante we find the aromatic intensity and overall quality of the nose higher for the sulphite modality.

Domaine du Bourdieu



At Domaine du Bourdieu, the Bioprotection modality has higher results for colouring intensity, aromatic intensity, overall nose quality and acidity.

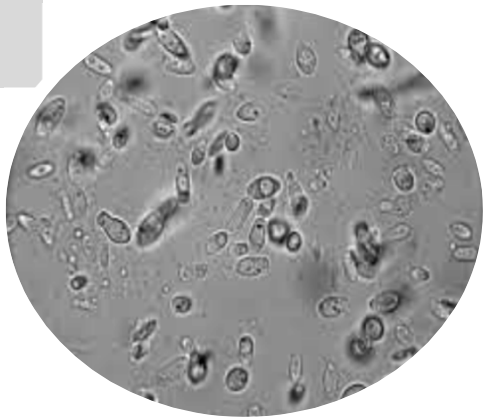
Brettanomyces

At domaine du Bourdieu the difference between the two modalities (sulphate and BioProtection must) is very small.

For Château La Conseillante the difference is more marked, and even if the ethyl-phenols tests confirmed that no molecules had been produced. The modalities have very high populations except the modality with early levurage and bioprotection with a smaller population.

It must be taken into account that a development of Brettanomyces is not systematically accompanied by the production of volatile phenols.

However, the results are put into perspective due to the absence of repeats on the tests.
This theme will be taken up in the RESPECT project



-The early preparation implantation of Bioprotection (red) alters the microbial balances.

-There is a significant effect of Bioprotection on population levels of acetic bacteria at incubating and onset of FA

-A significant effect on non-sacharomyce populations in early FA in red, greater than the effect of SO2

-A good occupation of the space of the different Bioprotection at the beginning of FA

-The effect on Brettanomyces is to be confirmed even if some results seem to favour the early use of LSA and Bioprotection

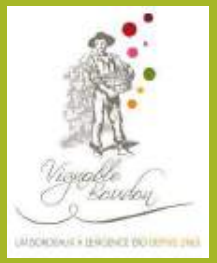
-Poor implantation of S. cerevisiae used in red levurage for The Bioprotection modality (competition with Primaflora VR LSA)

-No big difference in the tasting between the different modalities.

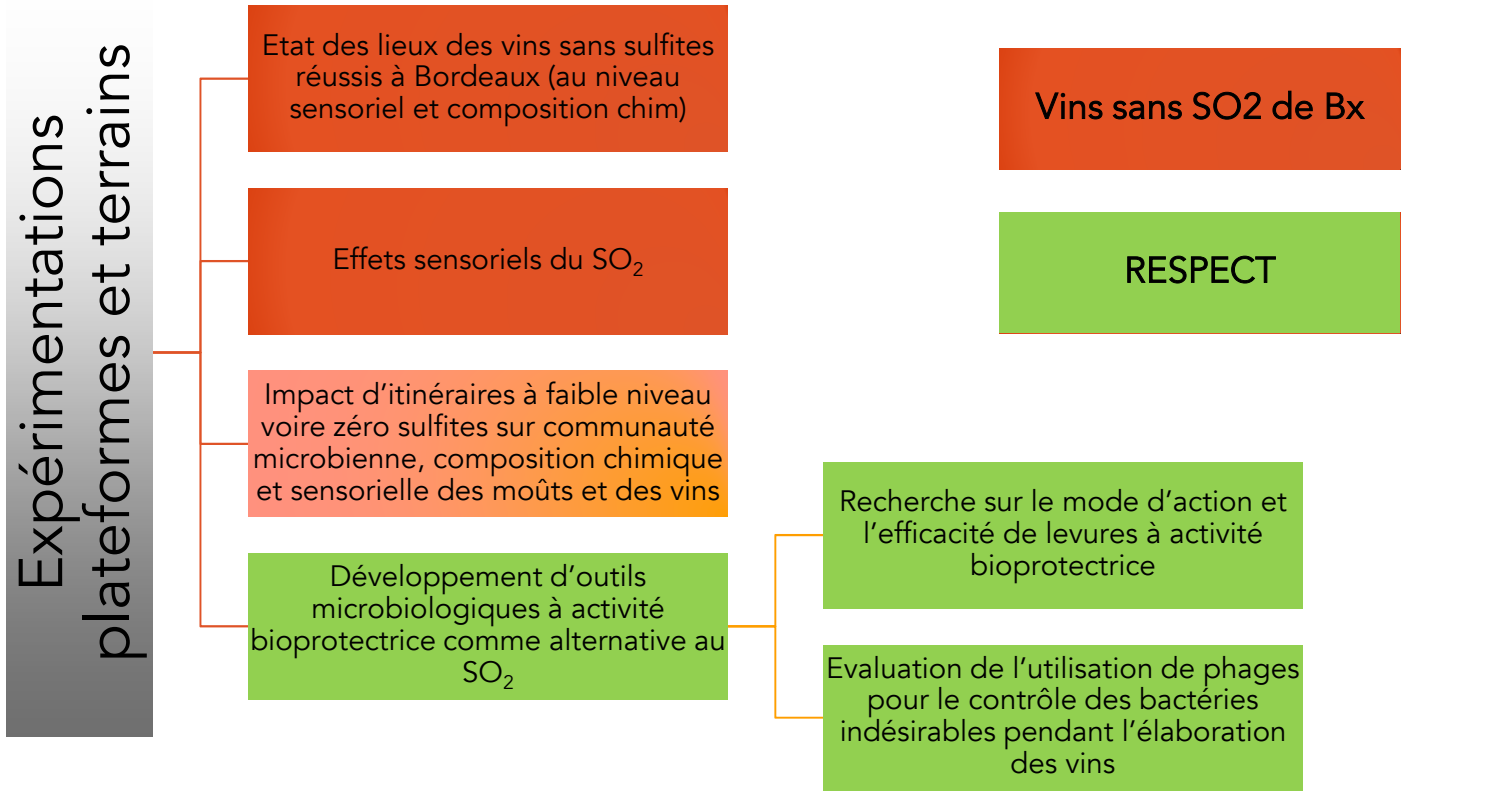
-a very good behavior of all modalities (including modality without any addition), whether from the point of view of fermentation kinetics, chemical analyses, implantation controls and tasting.

-The absence of sulphite results in a loss of antioxidant and aromatic potential, which is not compensated by the use of Bioprotection in the form of non-Saccharomyces or Saccharomyces yeasts.

PROJET RESPECT

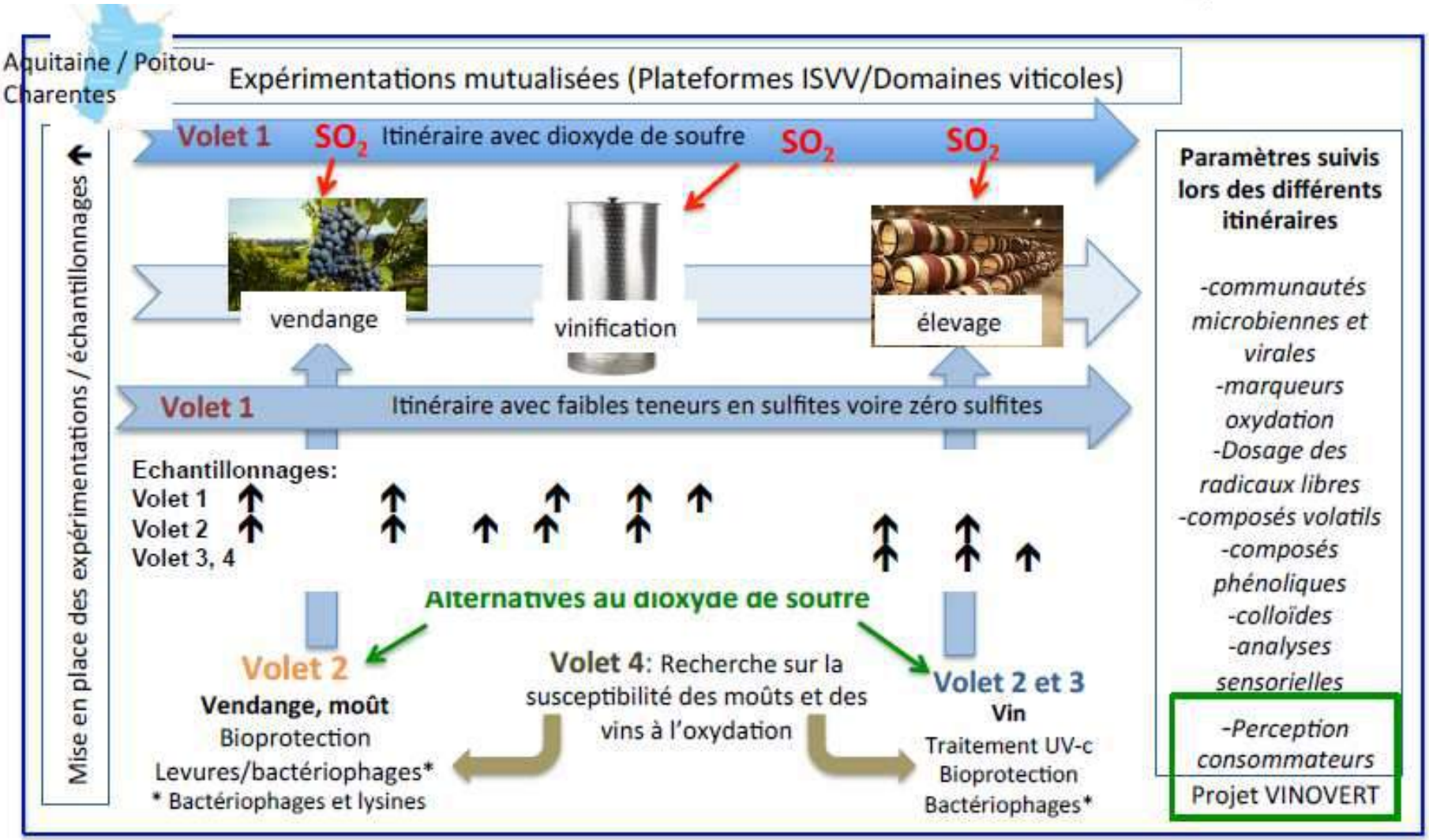


Objectifs RESPECT et vins sans SO2 de Bordeaux



RESUME PROJET RESPECT

Financé par



Source: appel à projet 2017:

PROJET RESPECT

- Objectifs

1. To determine the impact of low-level or zero-sulphite routes on the overall microbial community, the chemical, colloidal and sensory composition of musts and wines.

Comparative analysis and characterization of sulphite and low-grade wines/absence of sulphites. (Sensory mapping of wines without SO2)

2. Development of bioprotective microbiological tools as alternatives to SO2:

- Use of bioprotective yeasts: alternative to the antiseptic and antioxidant effect of SO2 (use on harvest or grape juice)

- Use of phages (and/or their lysines) to control unwanted bacteria. (Evaluated as part of laboratory-wide experiments).

- Analysis tools used

- MiSeq Illumina: High-speed sequencing for global approaches

Implantation control: PCR-delta to differentiation strains Saccharomyces cerevisiae.

Phageome analysis: a comprehensive view of the diversity of free-state oenological phages in the ecosystem

PCR-ITS "Internal Transcribed Transfer" to differentiation species of yeast (rDNA amplification). Know the microbiological diversity of must

MALDI-TOF/MS: Identification of microorganisms by mass spectrometry

Développement de la technique MALDI-TOF/MS

(Matrix-Assisted LasernDesorption/Ionization Time Off Flight Mass spectrophotometry)

- The technique will be transferred from the medical field to oenology and the preamble will consist of building a specific database of the vine/wine ecosystem.
- It identifies strains and their distribution. All techniques on one useful.
- It is adapted to the identification of a wide spectrum of colonies for each population: analysis of 30 colonies - a hundred colonies.
- Interest: - simple
- - fast
- - inexpensive.
- It can process a large number of samples.

- Objectifs 3

3. Impact of the new processes on the chemical physical stability of wines during ageing.

Deux axes:

- L'utilisation de nouveaux procédés de stabilisation des vins permettant de limiter l'utilisation de SO2 tels que les UV-c.

- L'identification de la matrice colloïdale et plus précisément l'impact de la réduction du SO2, sur la stabilité des vins au cours de la vinification.

- Objectif 3

- **UV-c:** cold sterilization of murky and coloured liquids.

UV-c radiation at 254 nm that destroys the DNA of yeasts and bacteria causing their death or annihilating all their reproductive functions with death from eventual microorganisms.

Reducing SO2 or using UV-c will generate:

An impact on macromolecular complexes formed during breeding.

- Changes in colloids formed and which will therefore lead to a change in the chemical physical stability of the wines (loss of color, precipitation, browning, etc.).

- Impact on wine filterability
- Impact on oxygen management

- Objectifs 4

4. Evaluate by the RPE technique (Electronic Paramagnetic Resonance) to reduce the dose of SO2.

Comparer la susceptibilité des moûts et des vins obtenus au cours des différents itinéraires techniques

Cette approche permet de

Mieux apprécier les effets potentiels antioxydants des levures à activité Bioprotectrice et des UV-c sur la formation des radicaux libres au cours de l'application de ces traitements.

VIN DE BORDEAUX SANS SO2

- **Wines without SO2 produced in industrial conditions: state of play.**

Sensory and compositional characterization of wines with low doses of sulphur dioxide.

Sensory effects of SO2.

Study on the organoleptic impact of SO2 in red wines.

Work related to the reaction chemistry of SO2 will be implemented and will concern the compounds potentially involved (flavour compounds, phenolic compounds, etc.).

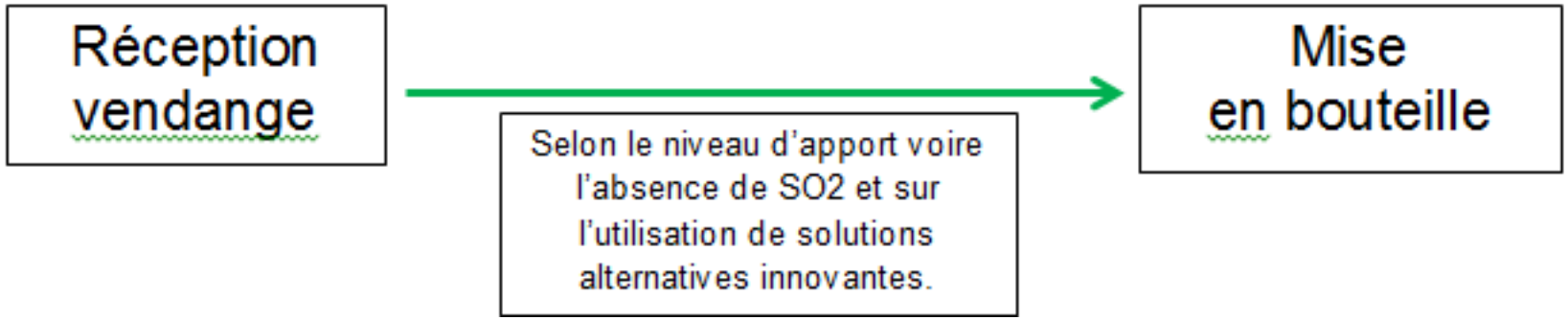
What technical itineraries for the production of wines without (or low level of) SO2 in Bordeaux.

Modalities incorporating advanced harvests and/or with a low percentage of altered berries will be tested to assess the risks associated with the development of sulphite-free wines for ruptured routes.

Co-financed by the CIVB

Interest

Microbiological, physical-chemical, chemical and sensory data will be collected, cross-referenced and integrated to generate knowledge across the entire production chain



This project will allow practitioners to adapt their technical routes to reduce SO2

ORGANISATION DU PROJET RESPECT

ESSAIS PARTICIPANTS 2017

Ampelidae

IFV

SVBNA

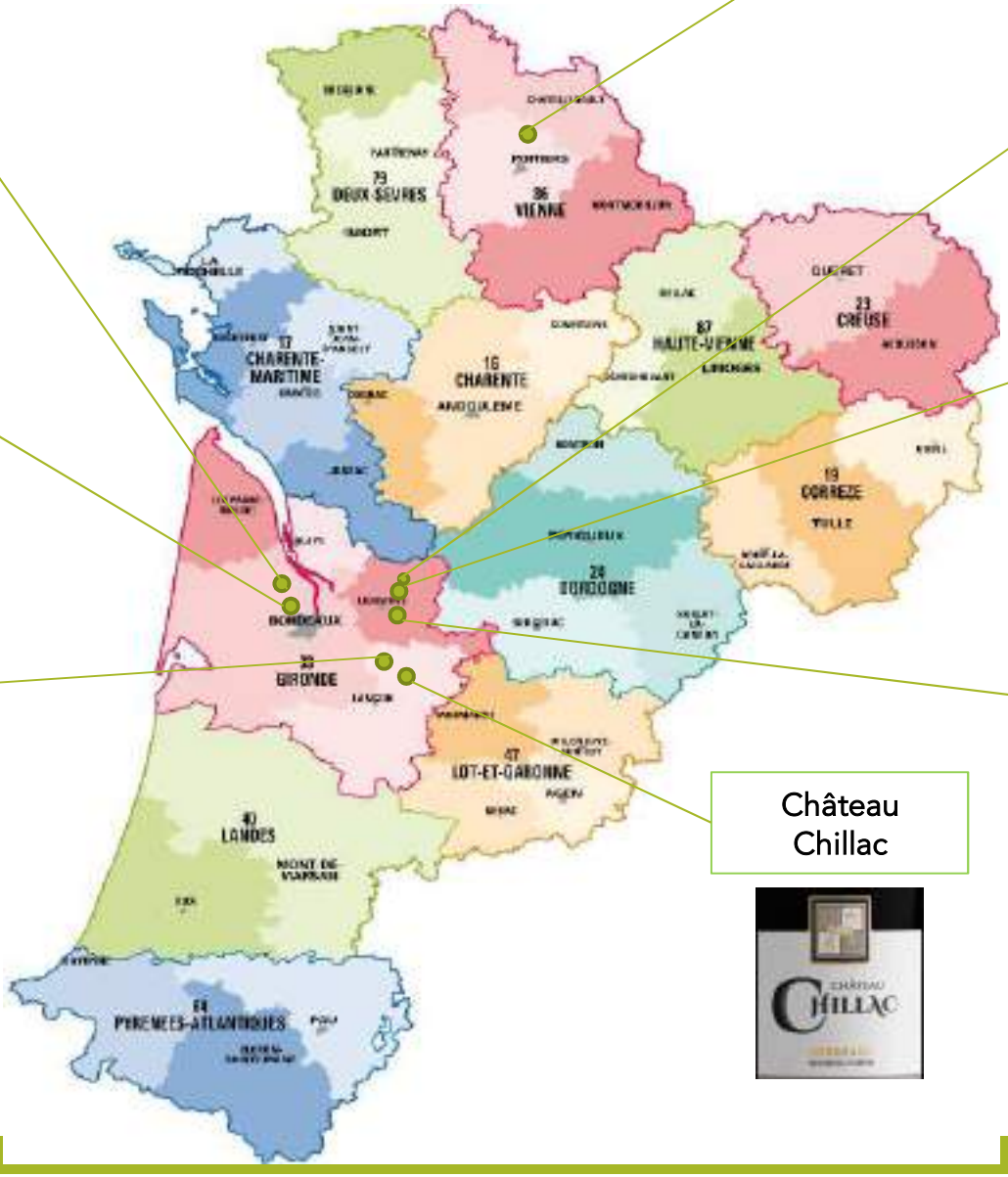
ISVV

Château
La Conseillante

Vignoble Boudon

Vignoble Bardet

Château
Chillac



NOUVEAUTES DU PROJET RESPECT

- Classic route with SO2 and low-grade route (usual 1/2 dose) or without SO2.
- Characterization of wines without SO2.
- Itineraries with consideration of healthy harvests with advanced maturity and harvests partially altered by the rot at the end of the season (up 10%).
- Larger cold prefermentaries
- The use of long-latency strains of Saccharomyces cerevisiae capable of colonizing the environment early as a bioprotection agent.
- Implementation and evaluation of different stabilization techniques.
- It will allow further research to the breeding part and assess the behaviour of the different modalities up to bottling.

2017

VIGNERONS BIO
NOUVELLE AQUITAINE

Protocol 2017

Platform conditions

2ème date : vendange plus altérée

	IFV	ISVV
	Vin rouge	VIN BLANC
	15/09/17 ET 22/09/17	
Cépage	Merlot	Sauvignon Blanc
Modalités 2x	- Sulfitage 5g/hL - Sulfitage 2,5g/hL - Zéro ajout - Zymaflore Egide 5g/hL sur vendange	IDEM - Sulfitage 5g/hL ~~- Pas sulfitage~~ - Zéro ajout - BioProtection 5g/hL
FA	21,30 L	4,5hL
FA	F33 20g/hL	Zymaflore X5 20g/hL
FML	Vitilactic F1 1%	

Field conditions

	CHATEAU LA CONSEILLANTE	AMPELIDAE
	In situ	In situ
	Vin rouge	VIN BLANC
Cépage	Merlot	Sauvignon Blanc
Modalités 2x	- Sulfitage 5g/hL - Zéro ajout - Zymaflore Egide 5g/hL sur vendange	2x - Sulfitage 5g/hL - BioProtection 5g/
FA	Barriques Vinification Intégrale 225L	Barriques 225L
FA	Excellence XR 15g/hL	Zymaflore X5 20g/hL
FML		

avec pré fermentaire à froid

gros volumes

- ✓ New bioprotection strain tested
- ✓ Added a second harvest date
- ✓ Testing 2 so2 intakes
- ✓ Removing the LSA modality

IFV vinification

- Wine analyses on must (1st harvest date)

Nature de l'analyse	Modalité 1 : 5g/hL	Modalité 2 : 2,5 g/hL	Modalité 3 : sans SO2	Modalité 4 : bioprotection
TAP (%vol)	13,05	13,10	13,00	12,75
Acidité totale (g/L H_2SO_4)	3,10	3,10	3,10	3,10
pH	3,46	3,46	3,44	3,46
Acide malique (g/L)	2,9	2,9	3,0	3,0
Acide tartrique (g/L)	4,6	4,5	4,4	4,3
Azote assimilable (mg/L)	62	60	52	49
Sucres (g/L)	222	223	221	217

- Wine analyses on must (2nd harvest date)

Nature de l'analyse	Modalité 1 : 5g/hL	Modalité 2 : 2,5 g/hL	Modalité 3 : sans SO2	Modalité 4 : bioprotection
TAP (%vol)	**13,35**	**13,65**	**13,75**	**13,30**
Acidité totale (g/L H_2SO_4)	**2,70**	**2,65**	**2,75**	**2,80**
pH	**3,58**	**3,57**	**3,57**	**3,55**
Acide malique (g/L)	2,8	2,8	2,8	2,7
Acide tartrique (g/L)	4,1	4,1	4,0	4,0
Azote assimilable (mg/L)	61	63	52	45
Sucres (g/L)	227	232	234	226

	Date	Modalités			
		M1 (S)	M2 (1/2S)	M3 (0)	M4 (BV)
V	15/09/2017	Vendange (15/09/2017)			
	16 et 17/09/2017	Chambre froide à 4°C			
J 0	18/09/2017				Zymaflore Egide 5g/Hl sur vendange
		Eraflage - Foulage - Encuvage			
		SO2 5g/Hl	SO2 2,5g/hL		
J+1	19/09/2017	Mise à 10°C			
J+2	20/09/2017	Levurage F33 20g/Hl			
		FA 26-28°C			
Fin FA		Dosage des sucres + Inertage			
Macération Post FA	~ 10 jours				
Ecoulage		Hygiène irréprochable et inertage			
FML		Vitilactic F1 1%			
Fin FML		**SO2 5g/Hl** (SO2 25 mg/L SO2 libre)	**SO2 2,5 g/Hl** (SO2 13 mg/L SO2 libre) Chitosane?	Flash pasteurisation ? /lysosyme? / chitosane?	**SO2 2,5 g/Hl** (SO2 13 mg/L SO2 libre) Chitosane?
Elevage	nov-17	Assemblage des triplicats pour faire des duplicats			
		Contrôle SO2 / soutirage fin nov. Hygiène + Inertage			
	déc-17	Contrôle SO2 Hygiène + Inertage			
	janv-17	Contrôle SO2/Mise au froid pendant 15j. Début Jan. Hygiène + Inertage			
	févr-17	Contrôle SO2/ soutirage début fevr. Hygiène + Inertage			
	mars-17	Contrôle SO2/soutirage fin mars Hygiène + Inertage			
	avr-17	Contrôle SO2 Hygiène + Inertage			
Filtration	mai-17	Filtration sur cartouche: 5 et 1 micron	Filtration sur cartouche: 5 et 1 micron	Filtration stérile	Filtration sur cartouche: 5 et 1 micron
Mise en bouteille	mai-17	25 mg/L SO2 libre	13 mg/L SO2 libre	10 mg/L SO2 libre	13 mg/L SO2 libre
Bouchage		Bouchage synthétique/ liège?			
Dégustation	mai-17				
	mai-18				

PRELEVEMENTS

BLANC	ROUGE
Pressurage	Encuvage après homogénéisation
Après débourbage	Jour + 1
Début-FA	Jour + 2
Mi-FA	Début-FA
Fin-FA	Mi- FA
	Fin-FA
	Elevage

Analyses

Chemical:

On Must: TAP ,density,pH,AT and assimilable nitrogen

On wine (Fin-FA): TAV, AV ,pH,AT and SO2 total

Microbiological

Tracking oxidation and aromatic compounds

Monitoring the assimilation of precursors (Glutathion ,flavanols, phenol acids, flavour precursors, GRP)

- Alcoholic fermentation
-

	Modalités	Temps de latence	Durée de FA
DATE I	Modalité 1 : SO_2 5g/hL	1 jour	10 jours
	Modalité 2 : SO_2 2,5 g/hL	1 jour	10 jours
	Modalité 3 : SO_2 sans SO_2	1 jour	10 jours
	Modalité 4 : Bioprotection	1 jour	10 jours
DATE II	Modalité 1 : SO_2 5g/hL	2 jours	11 jours
	Modalité 2 : SO_2 2,5 g/hL	2 jours	11 jours
	Modalité 3 : SO_2 sans SO_2	2 jours	11 jours
	Modalité 4 : Bioprotection	2 jours	11 jours

Oenological Analysis After FA - Date I

Modalité 1 : SO_2 5g/hL

Modalité 2 : SO_2 2,5g/hL

Modalité 3 : Sans SO_2

Modalité 4 : Bioprotection NS vendange+sans SO_2

Nature de l'analyse	Modalités											
	1.1	**1.2**	**1.3**	**2.1**	**2.2**	**2.3**	**3.1**	**3.2**	**3.3**	**4.1**	**4.2**	**4.3**
TAV (% vol)	13,40	13,50	13,55	13,30	13,50	13,55	13,50	13,50	13,50	13,30	13,40	13,40
AT (g/L H_2So_4)	3,80	3,80	3,90	3,80	3,90	3,90	3,90	3,90	4,00	3,90	3,80	4,00
AV (g/L H_2So_4)	0,14	0,14	0,13	0,15	0,16	0,13	0,11	0,12	0,13	0,14	0,15	0,14
SO_2 Libre (mg/L)	10	10	10	6	6	6	6	6	6	6	6	6
pH	**3,64**	**3,65**	**3,64**	3,63	3,63	3,63	3,60	3,60	3,61	3,61	3,64	3,61
Acide malique (g/L)	1,9	1,9	1,9	1,8	1,8	1,8	1,9	1,9	1,9	2,0	2,0	2,0
IPT	**52**	**54**	**52**	48	48	54	50	51	51	49	49	49
Brett. (UFC/ml)	0	0	0	0	0	2	0	0	0	0	0	0

• Oenological Analysis After FA - Date II

Nature de l'analyse	Modalités								
	1.1	**1.2**	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**	**4.3**
TAV (% vol)	14,10	14,30	14,10	14,30	14,00	14,20	14,00	14,20	14,15
AT (g/L H_2So_4)	3,70	3,80	3,80	3,80	3,80	3,90	3,80	3,90	3,90
AV (g/L H_2So_4)	0,10	0,10	0,10	0,09	0,09	0,08	0,10	0,10	0,09
SO_2 Libre (mg/L)	10	10	6	6	6	6	6	6	6
pH	**3,72**	**3,72**	**3,70**	**3,70**	3,69	3,69	3,68	3,68	3,68
Acide malique (g/L)	1,9	2,0	1,9	2,0	2,0	2,0	2,0	2,0	2,0
IPT	**64**	**64**	**66**	**67**	62	64	62	63	62
Brett. (UFC/ml)	0	0	0	0	<1	0	0	0	0

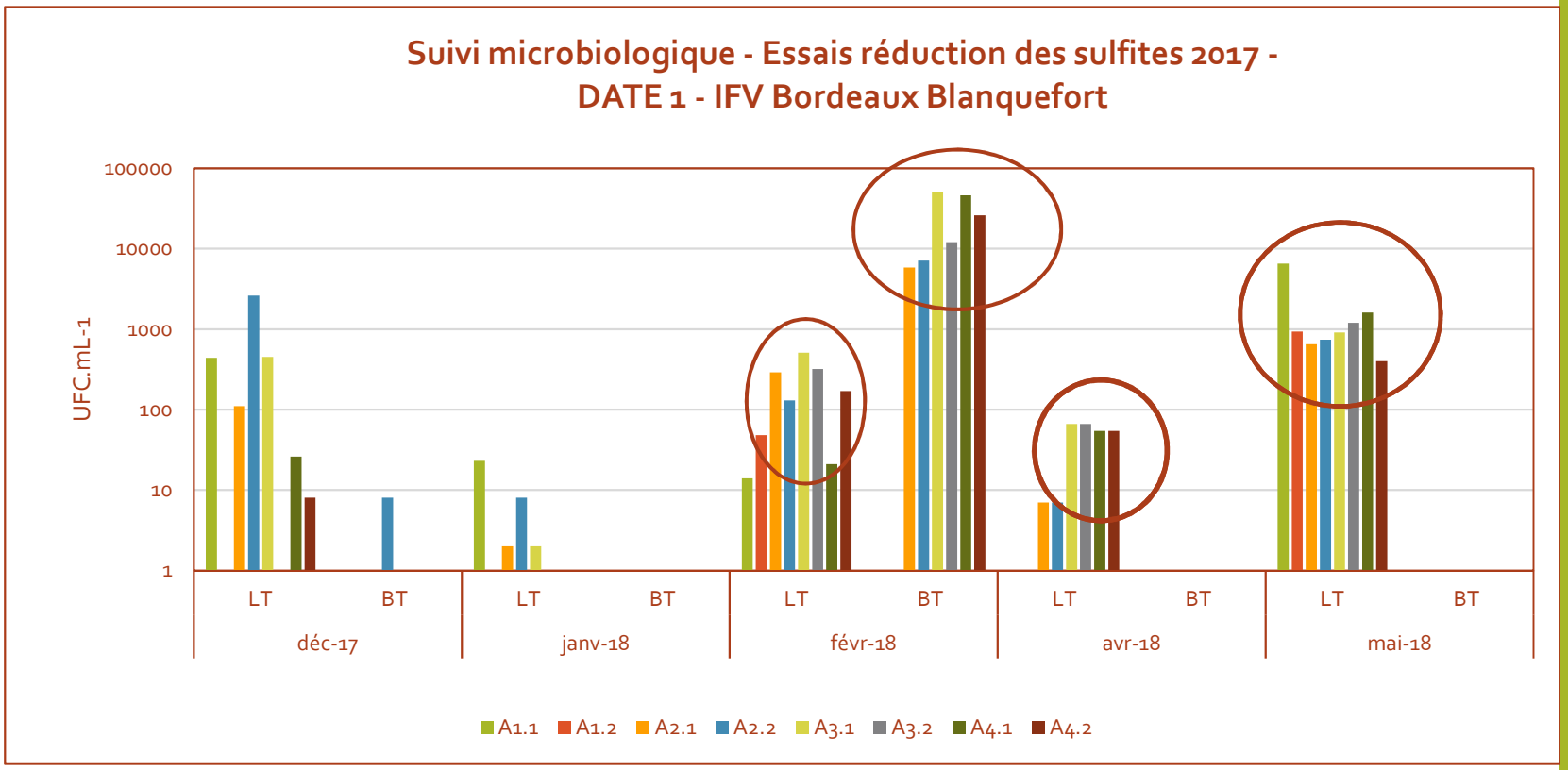
- Oenological analyses after FML at the date I

Nature de l'analyse	Modalités							
	1.1	**1.2**	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**
AT (g/L H_2So_4)	2,9	3,0	3,2	3,0	2,9	3,0	3,0	3,0
AV (g/L H_2So_4)	**0,21**	**0,21**	0,24	0,26	0,24	0,24	0,26	0,26
SO_2 Libre (mg/L)	20	24	14	10	0	0	0	0
SO_2 Total (mg/L)	68	69	19	15	5	1	1	1
Anthocyanes (mg/L)	**417**	**461**	347	353	325	332	300	349
pH	3,69	3,68	3,68	3,68	3,66	3,66	3,67	3,67
ICM corrigée (sous 1mm x 10)	12,50	12,75	11,94	11,98	12,40	12,78	12,12	12,23
IPT	**48**	**49**	47	48	47	48	**46**	47

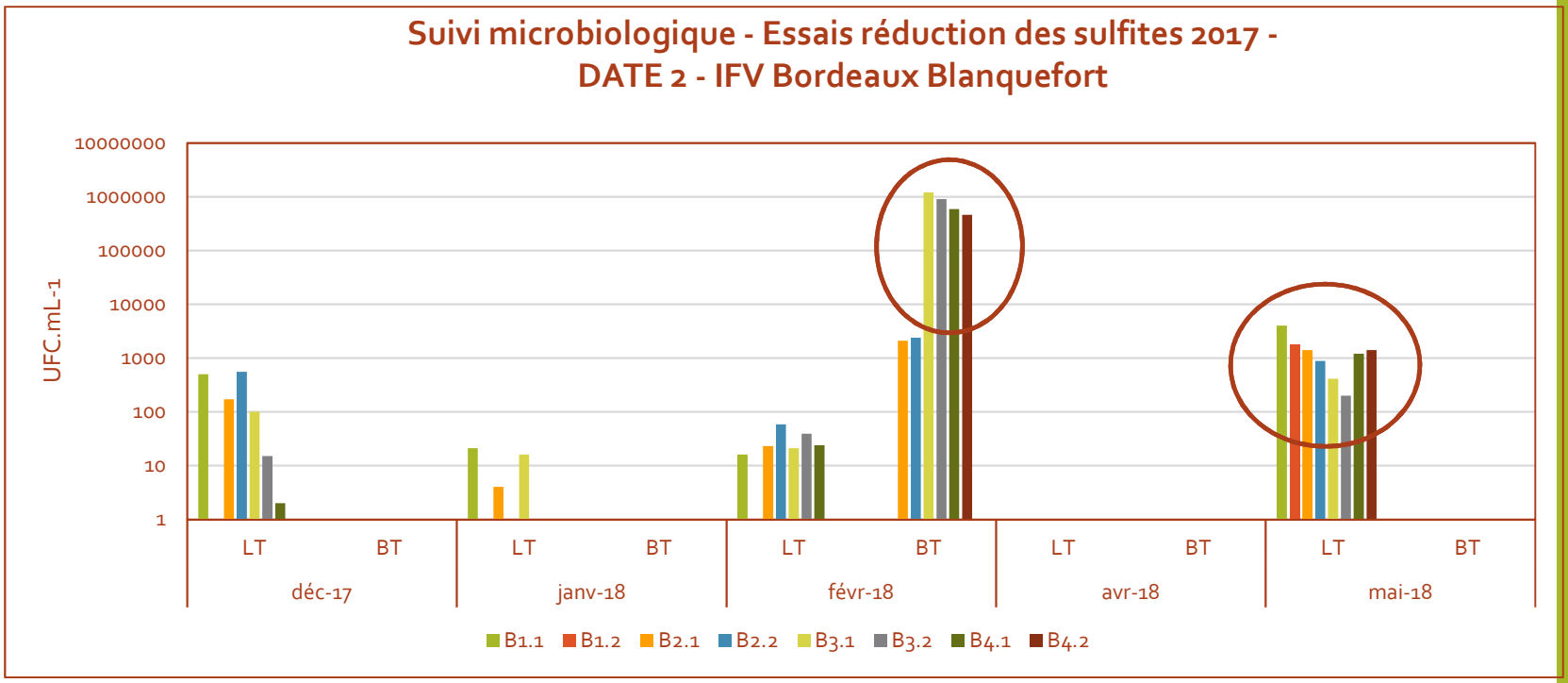
- Oenological analyses after FML at the date of the day

Nature de l'analyse	Modalités							
	1.1	**1.2**	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**
AT (g/L H_2So_4)	3,0	3,1	3,1	3,1	3,1	3,1	3,1	3,1
AV (g/L H_2So_4)	**0,18**	**0,18**	0,20	0,21	0,23	0,23	0,24	0,24
SO_2 Libre (mg/L)	25	30	16	16	0	0	0	0
SO_2 Total (mg/L)	74	78	35	35	3	1	1	1
Anthocyanes (mg/L)	**480**	**515**	450	445	382	351	328	318
pH	3,77	3,76	3,75	3,75	3,75	3,76	3,76	3,76
ICM corrigée (sous 1mm x 10)	14,25	14,97	14,83	14,98	14,46	14,30	14,30	14,43
IPT	59	60	59	58	59	58	58	58

Suivi microbiologique LT/BT – Date I

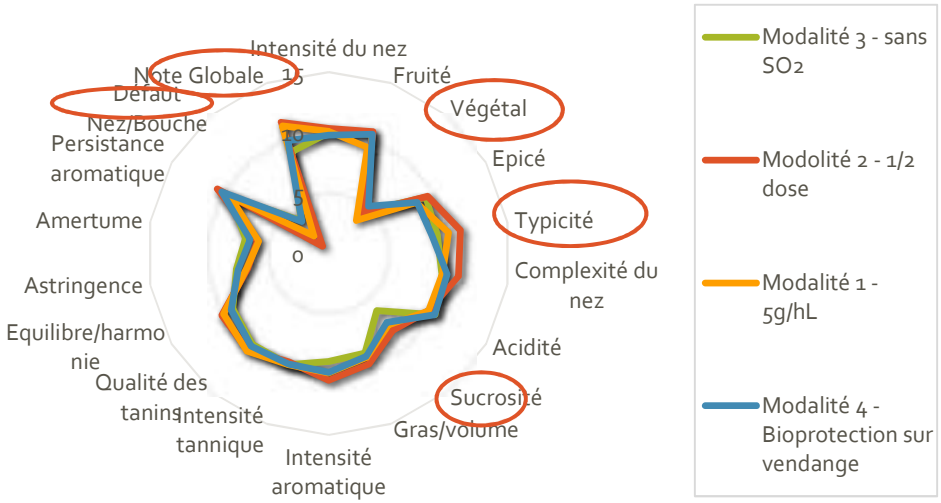


Suivi microbiologique LT/BT – Date II

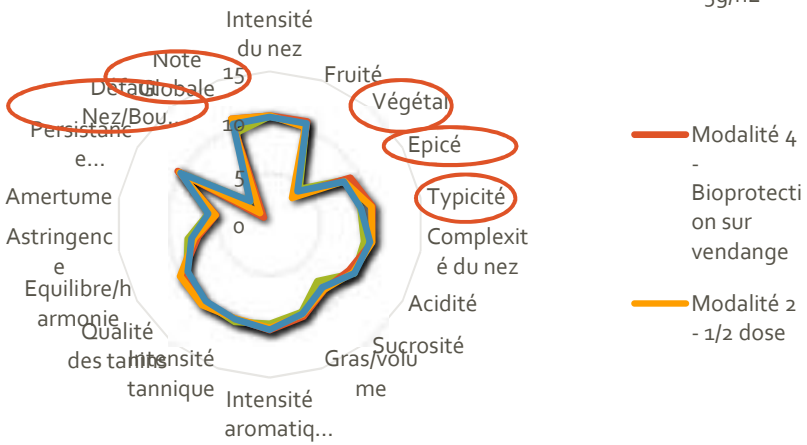


Dégustation Essai 3 1472A-17 / Date 1

- Dégustation du 24/04/2018



Essai 3 1472B-17 / Date 2



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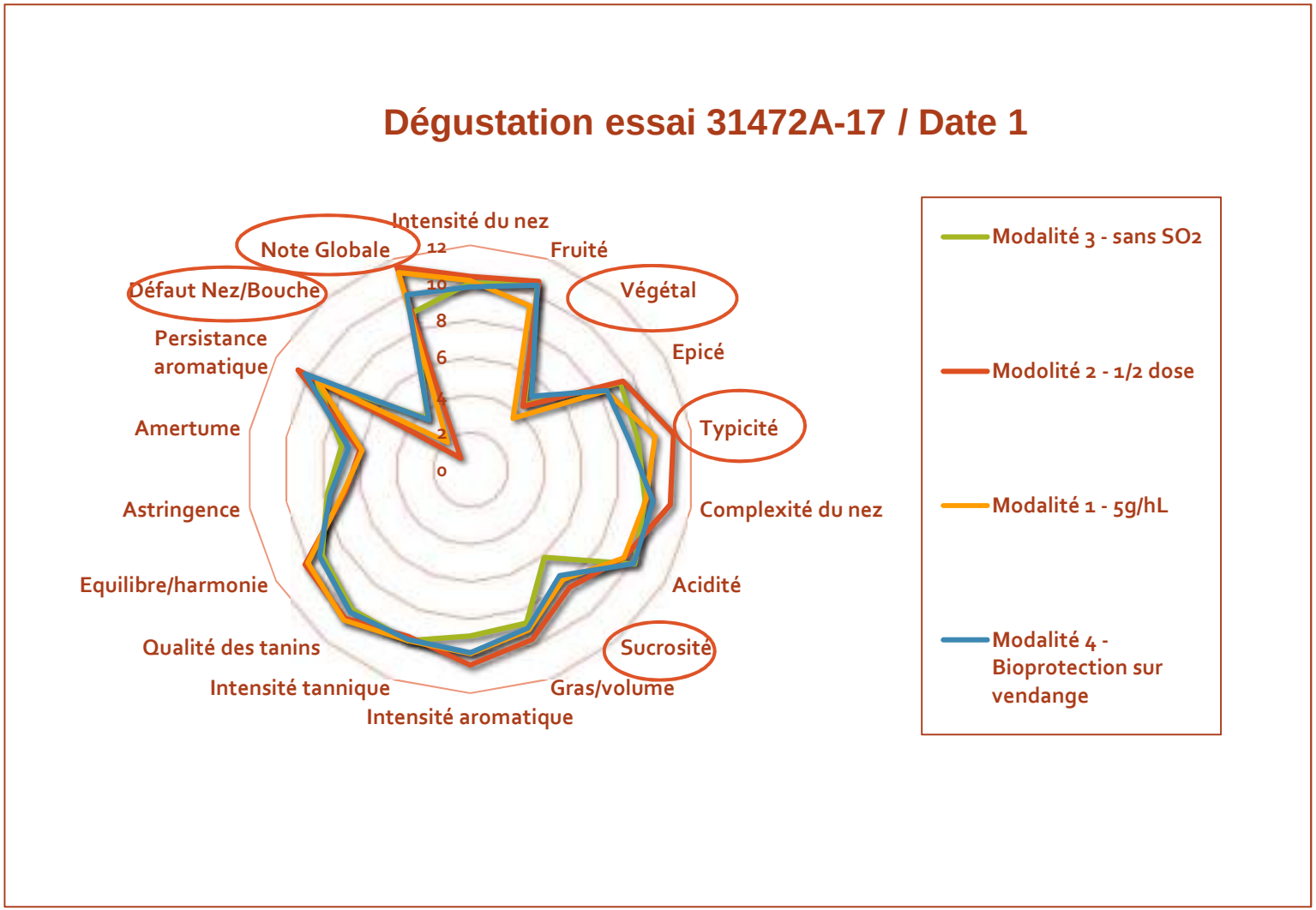
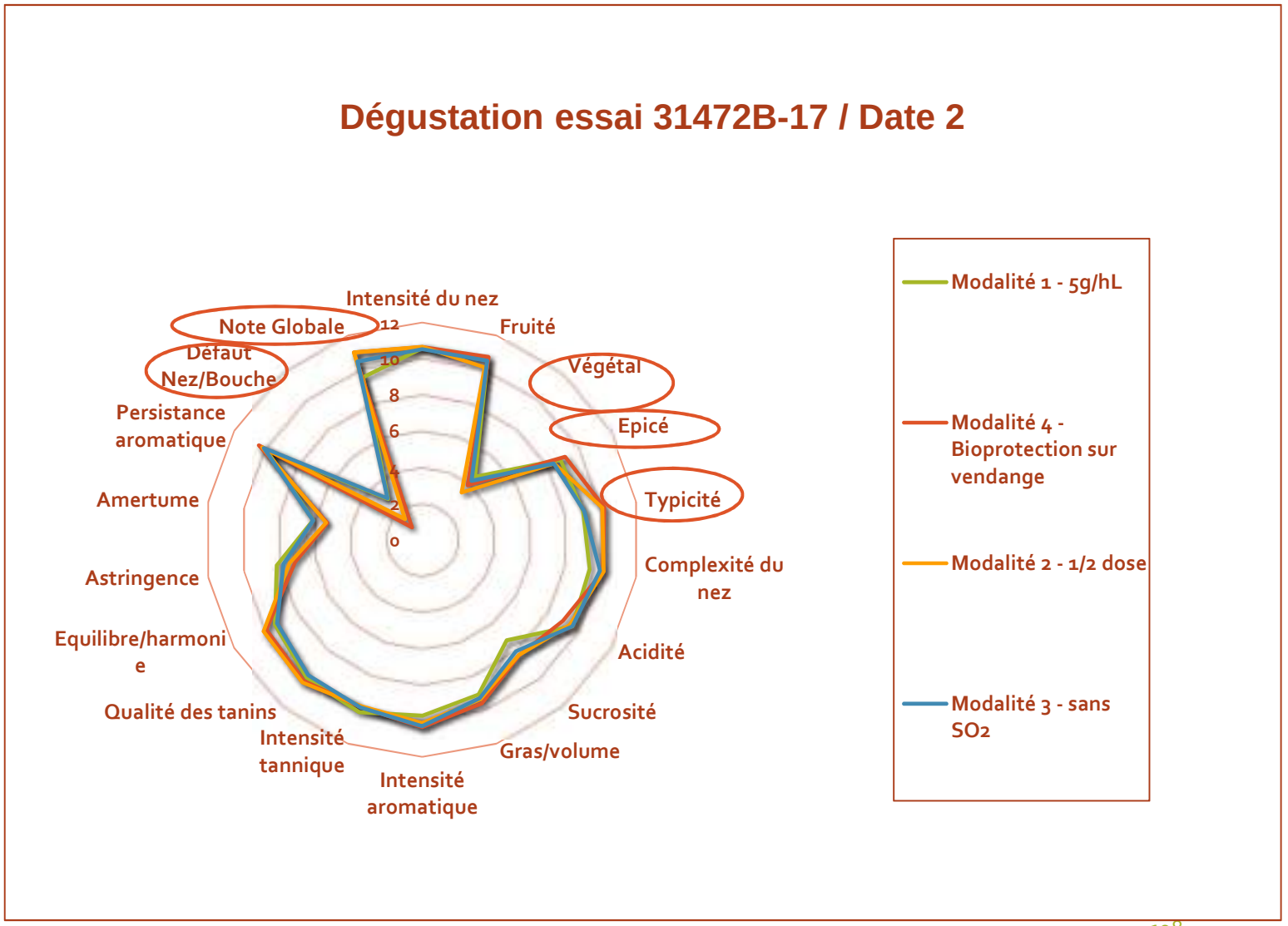


Dégustation – Date II



2017 Results

- Platform results in red

No difference in fermentary kinetics between modalities

No brett

pH slightly higher for sulphite modalities

Higher anthocyanin content in SO2 modalities

Tasting: modalities with SO2 come out better than the other two

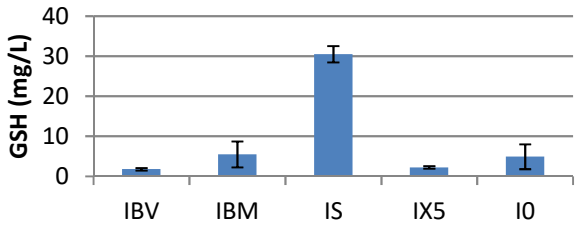
ISVV vinification

2017 Results

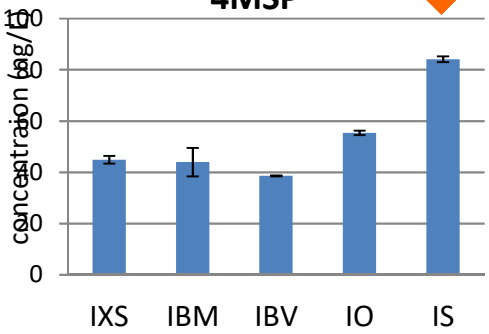
- Platform in white: what impacts on oxidation and aromatic potential?

Teneurs en thiols :

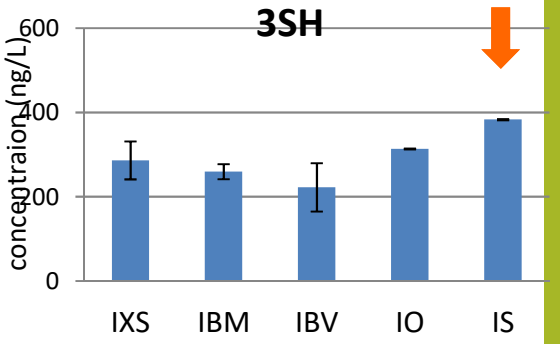
Glutathion : marqueur d'oxydation



4MSP



3SH



- Higher level in GSH sulphite modality
- Volatile thiols are impacted identically in the absence of SO2 and bioprotection
- No significant differences in sensory analysis

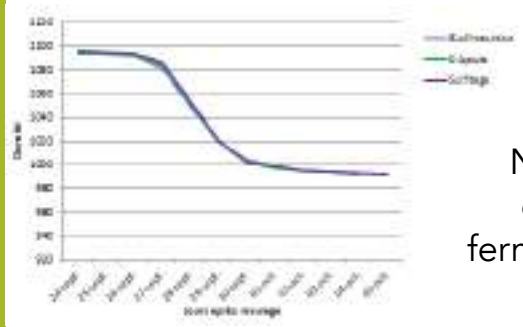
Château La conseillante

Résultats 2017

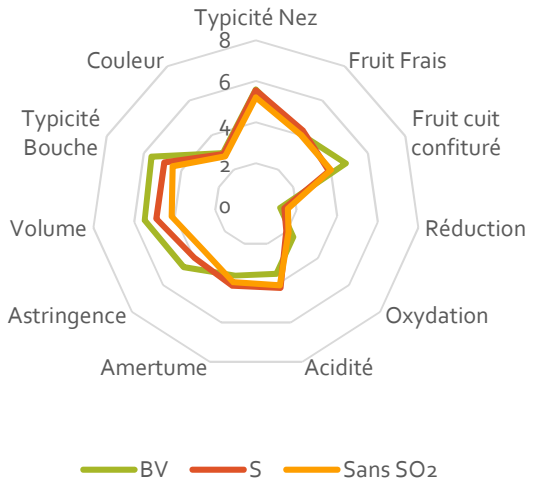
- Results The Council in red

Mod	G+F g/l	AV	AM
BPA	0,1	0,33	<0,2
BPB	0,1	0,34	<0,2
OA	0,1	0,3	<0,2
OB	0,1	0,32	<0,2
SA	0,1	0,28	1,7
SB	0,1	0,28	1,6

Sulphite-free and Bioprotection terms: FML under marc



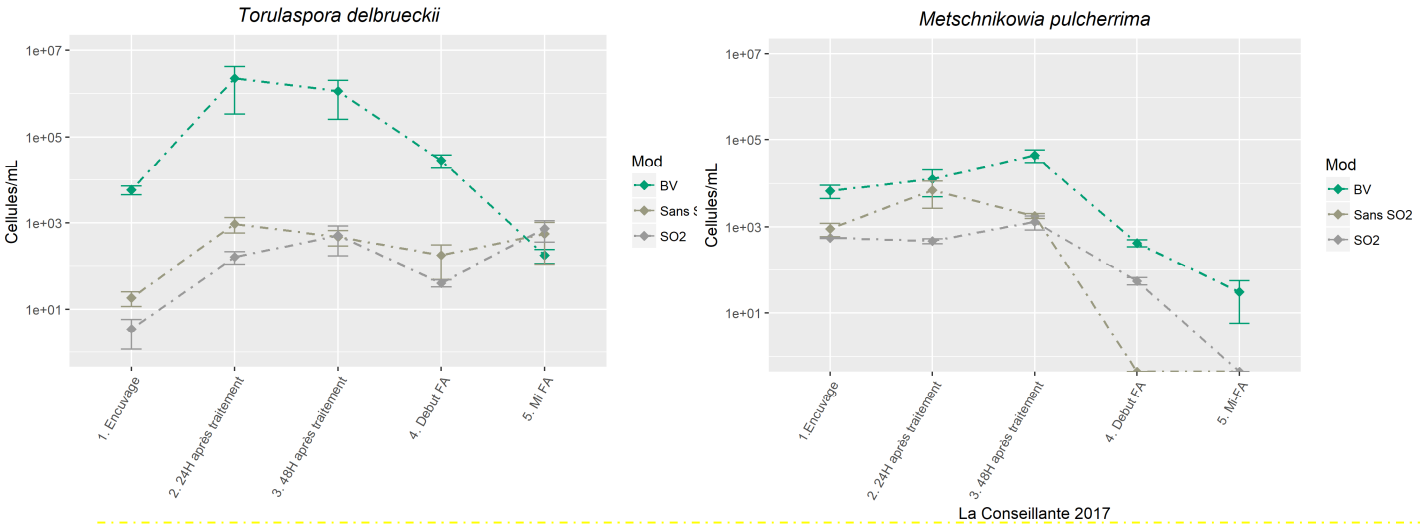
No significant difference in fermenting kinetics



- Aromatic compound analyses: furanones, lactones, thiols, esters...
- Sensory analysis
  - ➔ No significant difference between terms and conditions

Résultats 2017

- Résultats La Conseillante en rouge

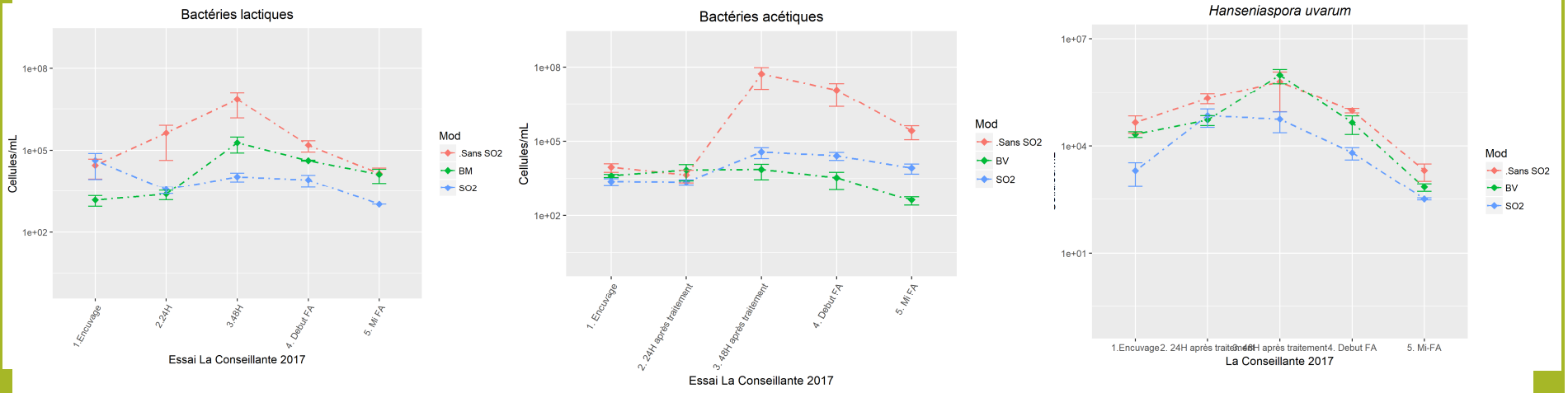


Bioprotection : blend *T delbrueckii* and *M. pulcherrima*

➔Effective implantation of bioprotective non-Saccharomyces yeasts

Résultats 2017

- Results The Council in red

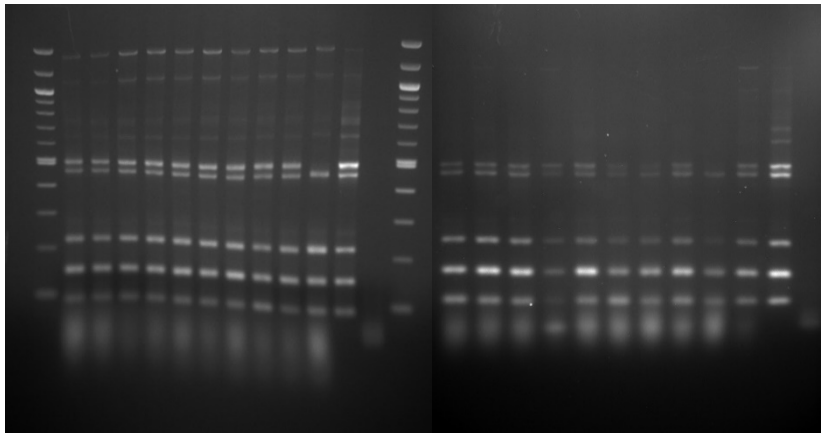


➔Significant effect of sulphite on bacterial population levels and non-sacch species Hanseniaspora uvarum.
➔Significant effect of bioprotection on bacterial population levels but less on population levels of Hanseniaspora uvarum.

Ampelidae

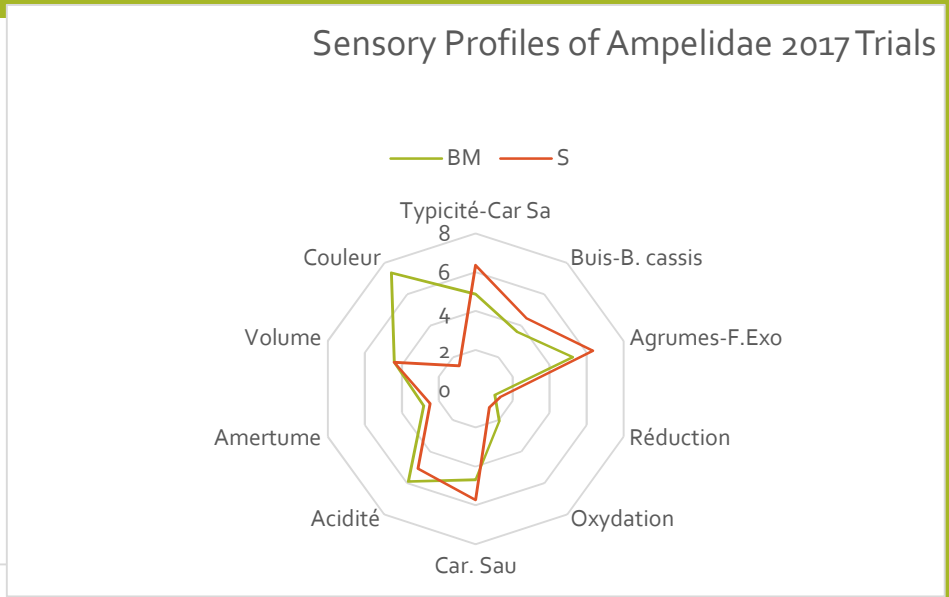
Implementation controls

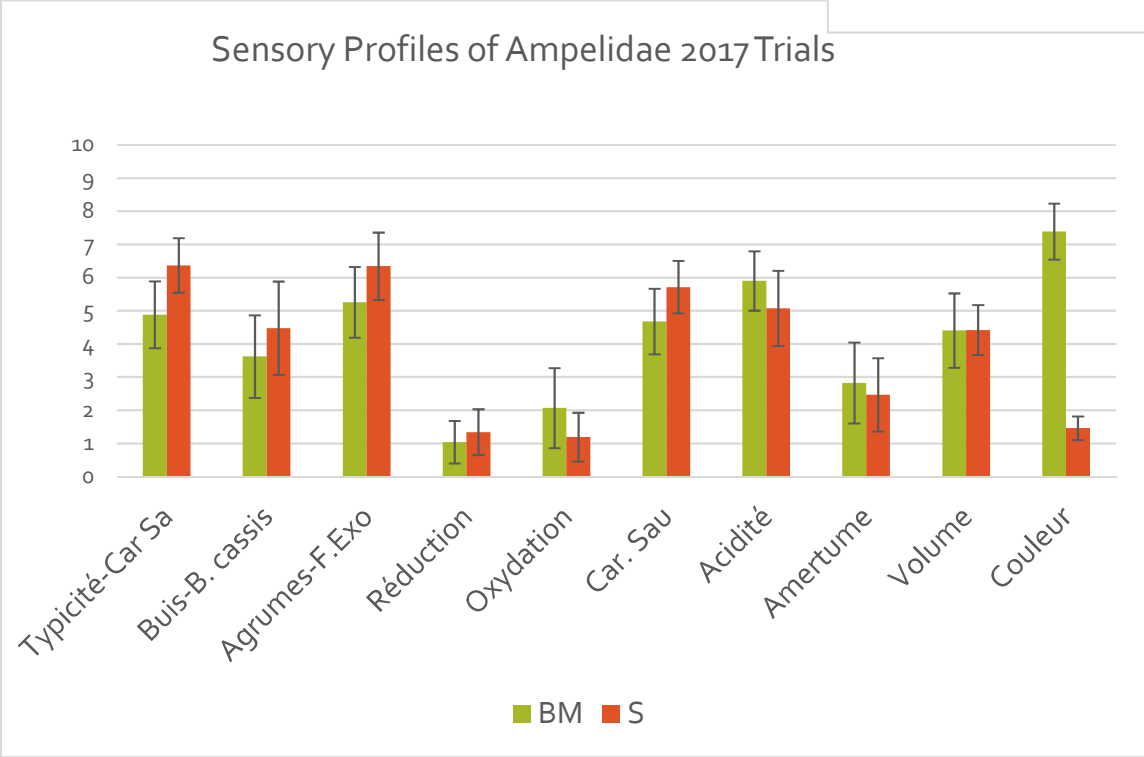
All the modalities showed an effective implantation of the X5 strain at more than 90%.



TERMS	CLONE NUMBER CORRESPONDING TO X_5
BM A	9/10
BM B	10/10
BM C	9/10
S A	9/10
S B	9/10
S C	9/10

A triangular test.
15 out of 17 tasters found the two different samples. Statistically, we can confirm that these two samples are different depending on the table of the binomial law.





Synthèse résultats 2017

- General: No difference in fermentary kinetics between modalities
- Plateforme rouge
  - pH et teneurs en anthocyanes plus importantes dans modalités SO2
  - A la dégustation : modalité avec SO2 sortent mieux que les deux autres
- White platform:
  - no difference in tasting
  - lack of sulphite results in a loss of antioxidant and aromatic potential, which is not offset by the use of Bioprotection.
- Domain in red: significant effect of bioprotection on population levels of lactic and acetic bacteria likely related to niche occupation

2018

VIGNERONS BIO NOUVELLE AQUITAINE

Protocol 2018

- ✓ Removing 2 SO2 levels
- ✓ Re-test of the LSA modality
- ✓ New bioprotection strain tested: Lachancea thermotolerans
- ✓ Bioprot - phages to manage FML under marc

Château Du Bourdieu	**Château Luchey Halde**	**IFV**		**ISVV**	**Château La Conseillante**
Sauvignon Gris	*Sauvignon Blanc*	*Merlot*		*Merlot*	*Merlot*
Modalités : en duplicat essai en barriques	***Modalités : en duplicat essai en barriques***	***Modalité en duplicatat cuve de 30 l***		***Modalités : en duplicat***	***Modalités : en duplicata***
-ajout Bio Protection Zymaflore EGIDE sur vendange (5g/hL)	-Modalité avec SO_2 (5g/hL)	Date de récolte normale du domaine	maturité + 10 Jours surmaturité	- zéro ajout	-ajout Bio Protection sur vendange 5g/hl
-ajout SO_2 (5g/hl)	-Modalité sans SO_2	ajout Bio Protection 1 Zymaflore EGIDE sur vendanges (5g/hL)		- ajout SO_2 5g/hl	-zéro ajout
-Sans SO_2	-Modalité Bioprotection Zymaflore EGIDE (5g/hL)	ajout LSA F33 (5g/hL)		-Bioprotection Zymaflore Egide sur vendanges (5g/hL)	-ajout SO2 5g/hl
		- Sans SO_2		- Bioprotection Zymaflore Egide sur vendanges (5g/hL) + phages (un cocktail de 3 phages virulents sera ajouté à ~75% de la FA pour remédier aux FML sous marc : duplicatas ?)	
		-ajout SO_2 (5g/hL)		- Bioprotection *Lachancea thermotolerans* sur vendanges (5g/hL)	
X5 à 20g/hl	X5 à 20g/hl	F33 à 20g/hl		F33 à 20g/hl	Excellence XR à 15gr/Hl

Château La conseillante

VIGNERONS BIO
NOUVELLE AQUITAINE

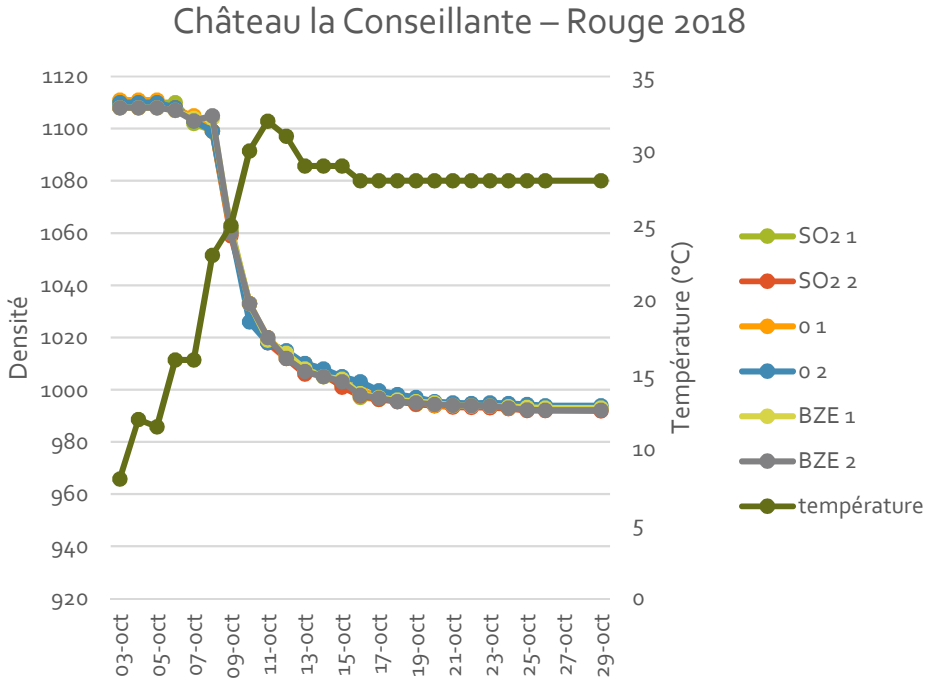
First results 2018

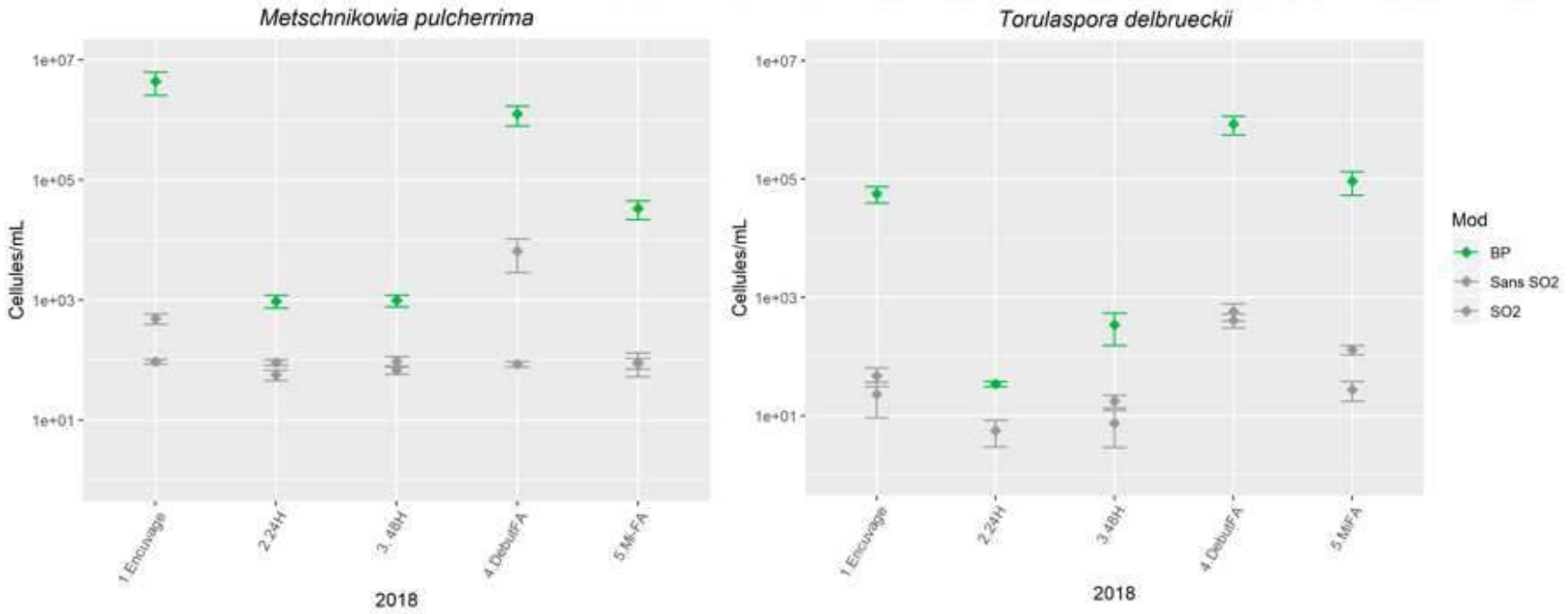
Pre-vinification analysis at 02/10

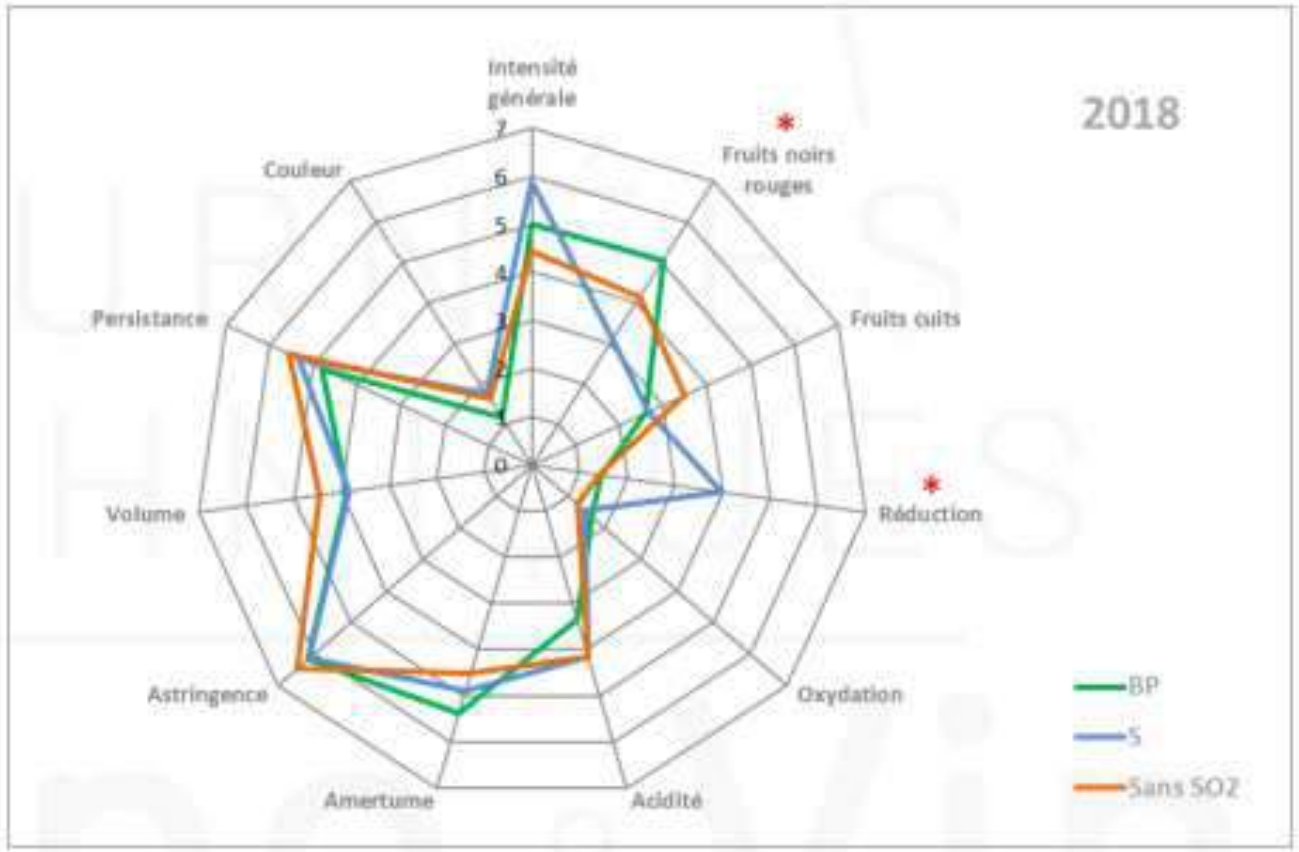
Contenant Millésime Volume Matrice/Couleur N° Labo		BZE 5 2018 Mout Rouge 1810024053	BZE 6 2018 Mout Rouge 1810024054	SO2 1 2018 Mout Rouge 1810024049	SO2 2 2018 Mout Rouge 1810024050	SS 1 2018 Mout Rouge 1810024051	SS 2 2018 Mout Rouge 1810024052
Degré Alcoolique	*%Vol*	0.30	0.25	0.20	0.45	0.10	0.20
Sucres Réducteurs	*g/L*	242.6	242.8	245.9	243.3	242.0	242.3
Degré Probable	*%Vol*	14.55	14.55	14.66	14.74	14.33	14.44
Acidité Totale	*g/L*	1.65	1.69	1.64	1.61	1.65	1.77
Acide Malique	*g/L*	0.9	1.1	1.1	1.0	1.0	1.0
pH		3.82	3.83	3.84	3.84	3.85	3.83
Azote Assimilable	*mg/L*	114	108	108	123	118	129
SO2 Libre	*mg/L*	< 5	< 5	71	69	< 5	< 5
SO2 Total	*mg/L*	< 10	< 10	132	122	< 10	< 10
Thiazote PH	*g/hL*	25	25	25	20	20	20
Phosphate	*g/hL*	40	40	40	40	40	40

FA completed at 29/10: SO2 modality on the end, AV similar -0.3 g/L

First results 2018

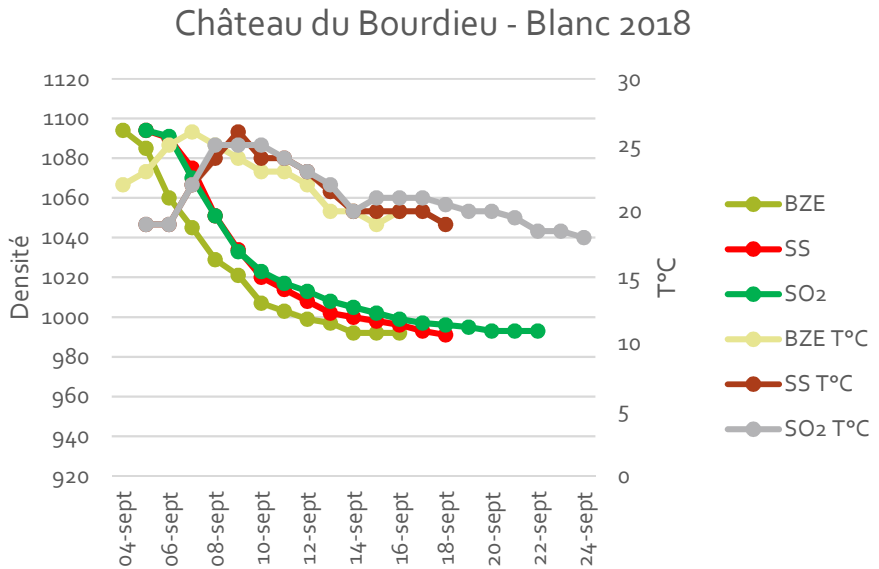



Metschnikowia pulcherrima
Torulaspora delbrueckii
Cellules/mL
1e+07
1e+05
1e+03
1e+01
1.Encuvage
2.24H
3.48H
4.DebutFA
5.MiFA
2018
Mod
BP
Sans SO2
SO2


2018
Intensité générale
Fruits noirs rouges
Fruits cuits
Réduction
Oxydation
Acidité
Amertume
Astringence
Volume
Persistance
Couleur
7
6
5
4
3
2
1
0
BP
S
Sans SO2

Domaine Dubourdieu

First results 2018



Premiers résultats 2018

Analyse après vinif au 19/12/18 – Vignobles Boudon

Nature de l'analyse	Modalités		
	SO_2 en pré FA (5g/hL)	Bioprotection (Egide 5 g/hL)	Sans SO_2 en pré FA
T.A.V % vol à 20 °C	14,2	14,15	14,3
Acidité totale g/L H_2SO_4	3,5	3,7	3,4
Acidité volatile g/L H_2SO_4	0,47	0,47	0,48
SO_2 Libre mg/L	nd	nd	nd
SO_2 Total mg/L	39	13	14
pH	3,28	3,29	3,36

VIN DE BORDEAUX SANS SO_2

Introduction

"Sulphite-free Bordeaux wines," a research project of the CIVB-supported UR Enology, began in 2018.

It aims to answer three questions:

- Les **vins rouges réussis** issus des cépages bordelais et produits sans sulfites ont-ils une typicité propre?
- Quels sont les conséquences compositionnelles et sensorielles de l'absence de SO_2?
- Quels sont les itinéraires techniques adaptés à l'élaboration réussie de ces types de vins?

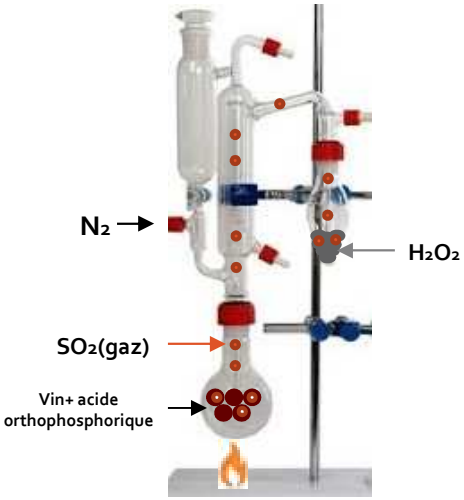
52 wines indicated to be without SO2 or with extremely low SO2 doses of the 2015 and 2016 vintages have been collected

Sensory Rating

Evaluation of olfactory and gustatory defects, Panel of 8 experts.

Determining SO2 content with Franz Paul

<30 mg/L



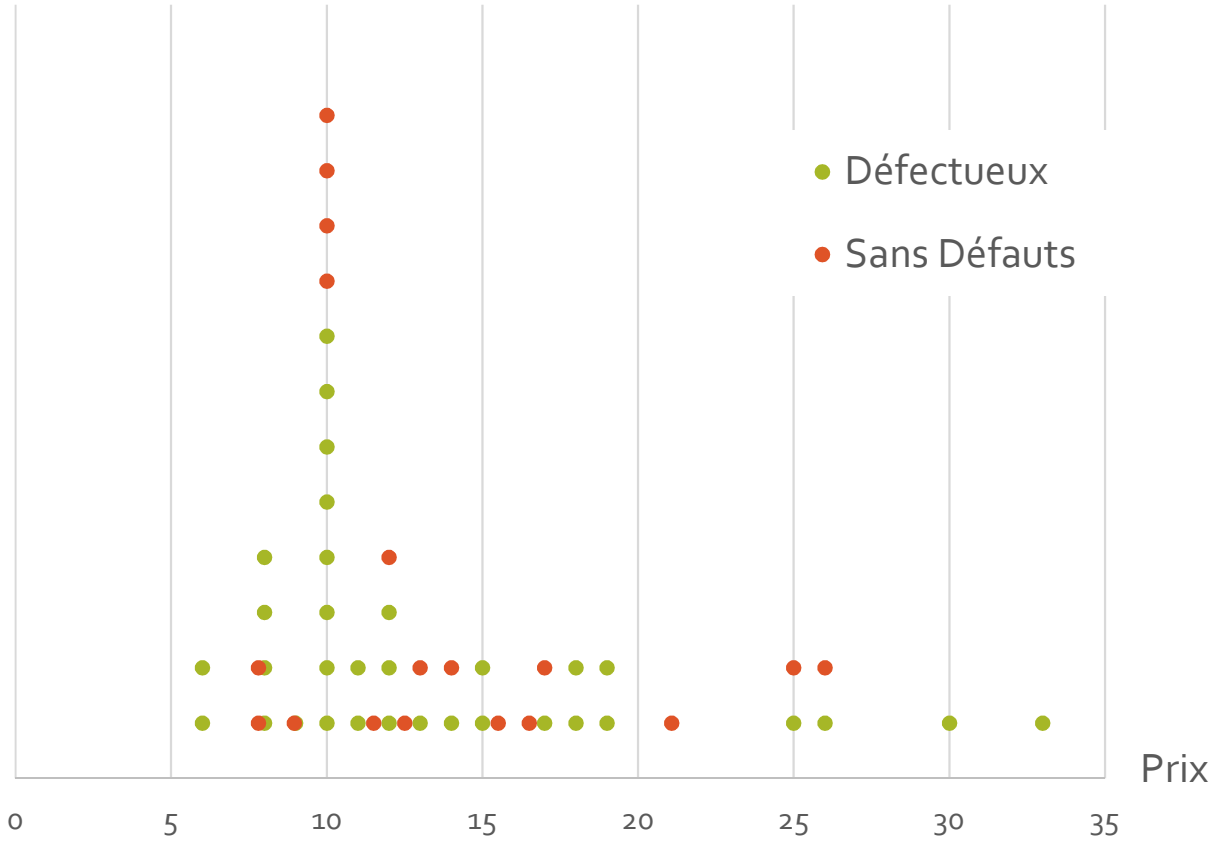
Dosage du SO_2 total

52 SO2 "no" samples

4 samples had a total SO2 content greater than 30 mg/L

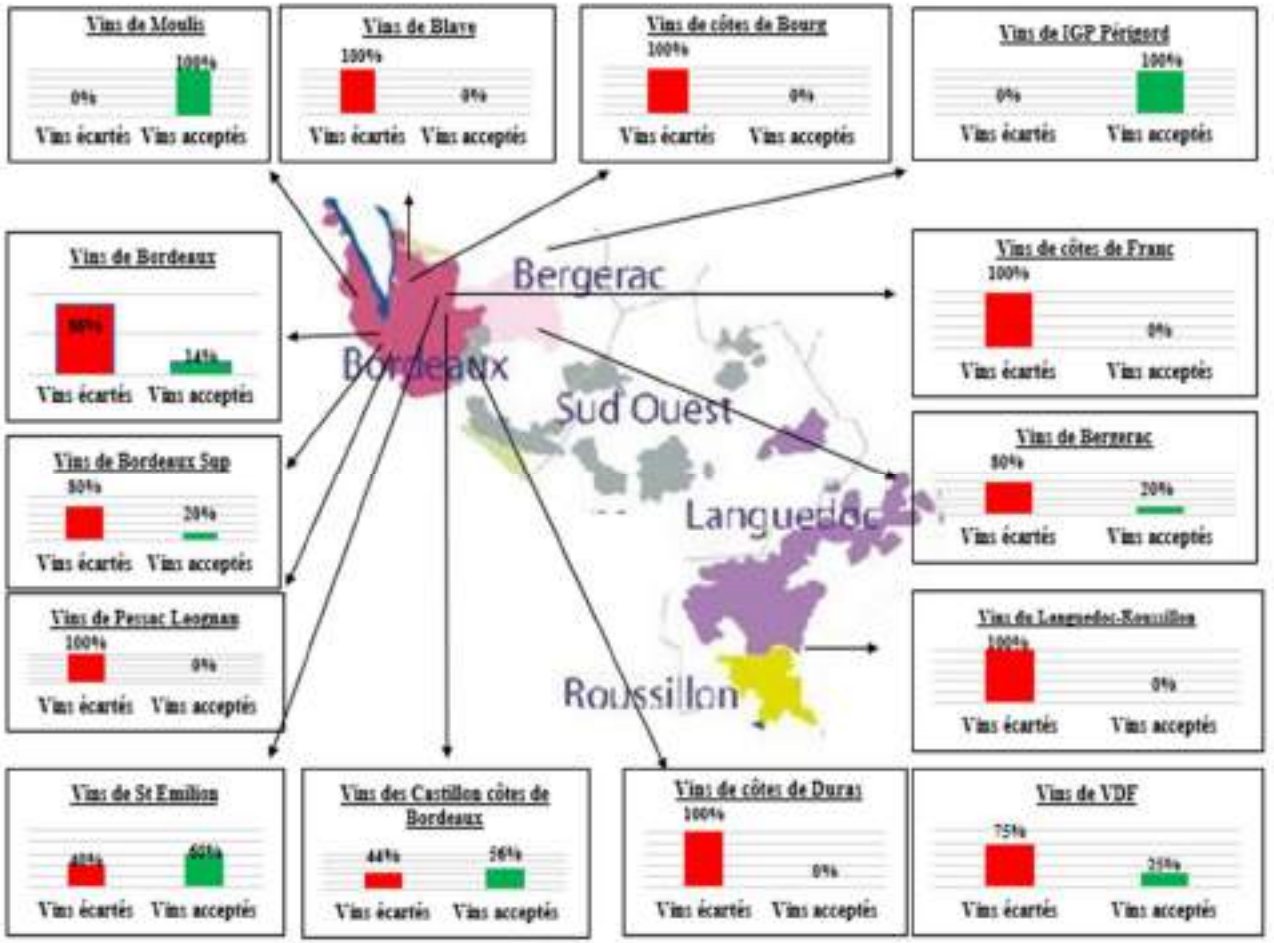
33 out of 48 samples, i.e. 69% had defects
The frequency of defective wines was similar for both Vintages

Evaluation of olfactory and taste defects for wines "without" SO2: an effect of the price of wines?



224

Evaluation of olfactory and taste defects for wines "without" SO2: an effect of the origin of the wines?



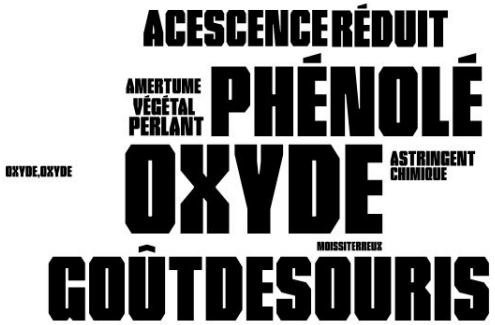
Evaluation of olfactory and taste defects for wines produced with SO2

20 samples with SO2

3 samples had defects

Characterization of defects

Wines less than 30 mg/L in SO2



Frequency of citation of default wines of 2015

Frequency of citation of default wines of 2016

Conventional wines

Fréquence de citation des vins à défauts

ON CELLARS

On Cellars

-Many properties are starting to make fermentations without SO2
-Often with very early seedings in LSA/tank foot or with preparations containing non-saccharomyces
-On bottled wines and fast rotation
-Some winemakers make wines without SO2 with livestock
-Tests and experiments are carried out on white wines

On Cellars

Key points

-A healthy harvest
-The management of the fermentation temperature
-Fast and frank departures in fermentation
-Good oxygenation of fermenting must
-Don't start doing SO2-free and native yeasts directly
-The control of dissolved oxygen is a key element during the breeding part
-Good microbiological control

THANK YOU FOR YOUR ATTENTION

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