Winemaking Chronicle

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Botrytis-altered grapes : Winemaking good practices for white wines

Example of a Popular Premium Sauvignon Blanc for international markets

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Our vision

The demands of the markets vary a lot both in space and time and our job as consultants is to help the wineries answer and adapt to these demands through the application of our winemaking good practices with prices adapted to the price segments.

The good practices are the core of our vision as consultants. Our definition of good practices is: a set of techniques applied to the winemaking process to reach planned objectives of price x sensory profile x market objectives.

Our good practices are based on experience of experimentation and experience of consulting in many different vineyards and wineries throughout the world.

A practical example

This article is based on a practical protocol for a Sauvignon Blanc wine (3-5€ FoB/bottle). This protocol is a recommendation for one of our consulting clients. They have applied it fir many years and obtained results conforming to their markets. Through slight adjustments, this example also works with other varieties and other market objectives.

On grapes that are usually planned for making Popular Premium wine but with a presence of a certain amount of Botrytis (max. 15-20% of contaminated berries), applying the following good practices allows to blend the resulting wine with the rest of the final commercial lot with no technical risks.

Contaminated zone and diffusion of the laccase: difference and similitudes

Extracting the must with high pressure extracts a lot of the compounds produced by the fungus such as glucanes, gluconic acid, compounds which are already very oxidised, aromas and flavours of earth and fungus. The damages are generally proportional to the amount of contaminated berries, to the mechanical trituration and to the pressure in the press.

The laccase diffuses very well in all the mass of the harvest and in the must including when the damaged zones are not very triturated, not triturated for a long period of time and/or when pressed at low pressure. Its initial concentration is proportional to the amount of contaminated grapes but, like all other enzymes, it can have a strong action even at low concentration if it encounters substrates and favorable conditions of catalysis, in particular dissolved oxygen. Additionally laccase will also oxidise compounds from sane berries.

To sum it up, with clusters with only 5-10% of contaminated berries you can end up with a wine completely oxidised IF you don't apply good practices for blocking the laccase.

Winemaking key-points for grapes altered by Botrytis cinerea

To be fast but efficient you should, firstly work with good practices, then make a list of key-points to be applied and lastly build a protocol upon these key-points.

Following are the key-points we used to build the protocol. For simple winery logic they are listed in chronological order.

The protocol built on these key-points is presented in the annex.

Key-point #1: Protect the grapes and the must against oxidations.

Action plan: Adjust the pH and add SO2 very early and add ascorbic acid / Add a specific inactivated yeast rich in reduced glutathione (e.g. Glutastar) and cover the grapes and the must with CO2 / Maintain Total SO2 at 30-35mg/L in the must until the clear start of alcoholic fermentation.

With these dosis, which are normal in making a varietal white wine, the SO2 effectively blocks the laccase. Between 30 and 35 mg/L of Total SO2 are enough, especially when the pH has been adjusted to 3,20 or less. Of course this Total SO2 must be present as soon as the first juices releases and it must be as homogenous as possible in all the mass of grapes and then in all the volume of pressed must.

With mechanical harvest the first additional SO2 and tartaric acid (for pH adjustment) should take place in the hopper of the harvest machine. With manual harvest the tartaric acid, the SO2, the ascorbic acid and the Glutastar are added on the grapes before destemming.

Of course with such a treatment we do not destroy the laccase. However if the laccase is kept blocked until its natural inactivation (by tannins, by the pH and with time) it will not cause major damage. The good practices of SO2-addition to block the laccase are also sufficient to block the oxidation chain-reactions by the oxidases of the grapes (tyrosinase) especially at pH lower than 3,20. This preserves certain varietal aromas of which the thiols, interesting or their participation to the fruity style of a Popular premium wine.

With this dosis and time of addition, the ascorbic acid supports the effect of the SO2 . Of course you want to use pure ascorbic acid. Avoid the use of commercial mixes with other ingredients. Some of them can have effects opposing the objectives of working with ascorbic acid.

An inactivated yeast rich in glutathione like Glutastar helps the antioxidante effect of the SO2 and also will have a very interesting sponge effect on elements of the must that are already oxidised and on negative elements produced by Botrytis. These effects are particularly interesting during the pumping of the grapes towards the press, during the short maceration, during the flowing of the pressed must and during the settling or flotation. Such an inactivated yeast also releases mannoproteins as soon as it comes in contact with the grapes and the must. These mannoproteins combine with interesting varietal aromas and protect and stabilise them.

Key-point #2: Limit mechanical triturations and strong chemicophysical extractions

Action plan: Add maceration enzymes / Destem and crush / Short maceration of maximum 2 hours / moderate temperature (max. 15°C/59°F) / Low pressure (max 0,2 bars).

From many experimentations, started in the 1990s, it is quite obvious that the early addition of maceration enzymes is very interesting on grapes contaminated by Botrytis. In a short maceration at moderate temperature we can consider that the enzymes work nearly exclusively on the pulp of the berry - pulp cells being more easily attacked by maceration enzymes (e.g. Lallzyme Cuvée Blanc)- and not directly on the damaged part of the grape -the pulp being the zone least contaminated by the mycelium of Botrytis- hence the enzyme don't amplify the damages of the fungus. Enzymes extract directly neutral polysaccharides (e.g. polygalacturonanes) which are fundamental for stabilising varietal aromas and the green color. They also make pulp cells more fragile which helps obtain a greater efficiency of the low-pressure pressing in extracting the right amount of must and the interesting aromas from the sane parts of the berry.

Destemming and crushing with well-adjusted machines opens the berry and doesn't triturate much the exterior part where the mycelium and the damages are situated. This opening of the berry combined with the enzymes enhances the early diffusion of the polysaccharides and aromas, which is the most interesting to benefit from the sane parts of the berry. Moreover, since we have added SO2,a ascorbic acid, Glutastar and dry ice before destemming, the grapes and the must are well protected and all the oxidation chain reactions are blocked. The initial protection and the low-pressure pressing are the keys to elaborate a varietal white.

Moderate temperature in the press helps limit the velocity of catechin-extraction phenomenon and oxidations.

From the reasons above it is quite obvious that is best to avoid the technic of « lees stabulation ».

Key-point #3: Absorb potential negative elements from the altered grapes

Action plan: At the beginning of alcoholic fermentation (A.F.) add oak fragments (staves), add PVPP (5 to 10 g/hL depending on the risks of pinking for the vintage) and add the necessary amount of bentonite / When A.F. starts, mix daily / After the end of A.F. quickly add ageing inactivated yeast (e.g. Pure Lees Longevity)

As we already stated in key-point #2, the Glutastar we added to the grapes before destemming and crushing has a sponge effect on the negative elements of the altered grapes. In a situation of well-managed mechanical harvests part of the inactivated yeast (10g/hL) can be added in the transport bins. To apply this SO2 ad tartaric should be added to the hopper of the harvesting tractor and inactivated yeast to the transport bin only.

French oak with toasting medium+ (e.g. Ambrosia Complex by TN Cooper) is the most apt to this difficult task. The wood absorbs immediately negative elements from the altered grapes in the must and then participates in stabilising the coloidal matrix of the wined and the varietal aromas, giving it a better longevity.

In tis situation of low-pressure pressing with low extraction of compounds responsible for coarse sensations, PVPP here helps more in preventing pinking. It must be bought pure. Avoid commercial mixes in which other ingredients could have adverse effects to what you try to achieve in this protocol.

The bentonite must be added at the start of A.F. to reach its best effect on unstable proteins. This early addition also serves in absorbing certain quinones and other yellow pigments resulting in a greener and more stable colour.

Regular and repeated additions of an inactivated yeast for ageing such as Pure Lees Longevity during the first weeks of ageing will absorb regularly yellow pigments and aromas of evolution in addition to absorbing potentially dissolved oxygen. The wine will result fresher, cleaner and with a better longevity.

Key-point #4: Apply specific fermentation good practices

Action plan: During the filling of the tank add directly an adapted yeast (e.g. strains ICV-Opale 2.0 or Sensy) after rehydration with a protector (e.g. GoFerm Protect Evolution) / Add immediately a last generation organic nutrient (such as Stimula Sauvignon) / Keep the temperature between 17°C and 18°C (62°F and 64°F) and mix daily / At density 1060 add an organic nutrient (e.g. Fermaid O).

With altered grapes it is quite obvious that a good management of the SO2 is fundamental for the longevity and the protection of the varietal aromas. As a consequence a hybrid strain of yeast that doesn't produce SO2 nor acetaldehyde is a key-point to obtain effective and stable SO2 during ageing. Furthermore, actions that ensure a very low metabolism of SO2 by *Saccharomyces* are very important: the right dosage of yeast (30 g/hL), rehydration with protection, a good nutrition from at the start with organic nutrient. All of this helps in a rapid start of A.F. and helps avoid an excessive production of sulphur compounds. With the added risks of fungus and earth aromas coming from Botrytis, it is fundamental to manage correctly the sulphur 'pool ' of the wine. Direct inoculation of a selected yeast with a good rehydration is essential in this protocol since selected yeasts have a high content in stress-resistance factors which, in turn, will help ensure a regular and complete A.F., obtain a better expression of varietal aromas and obtain a good balance of the sulphur 'pool'. Any process of multiplication in the winery before inoculation dilutes these resistance factors and will result in wine less clean, less sound, with less varietal aromas and less longevity.

A nutrient such as Stimula Sauvignon added at the beginning of A.F. helps enhance and stabilise fresh and mineral varietal aromas which is the best we can hope to achieve with altered grapes. The insoluble part of Stimula Sauvignon will also act as a sponge on the elements Glutastar wouldn't have absorbed beforehand, hence completing the sponge effect Glutastar started.

The initial temperature of 18°C (64°F) allows a rapid start of the A.F. which is essential when working with such a must. It is also the most interesting temperature to develop varietal aromas in Sauvignon Blanc, to avoid excessive sulphur compounds and avoid any excess of fatty acid with rancid aromas. Finally, this temperature allows for a regular end of A.F. in a situation where slow A.F. would be problematic and an additional risk of pinking.

The daily mixing put back in suspension all the biomass of yeast ensure a regular A.F. and prevent the heavy lees from compacting which is a source of an excess of sulphur compounds.

Key-point #5: Apply specific ageing and storing good practices

Action plan:

1- When sugars are finished: do an oxidasic breakdown test (over exposure to oxygen to check for browning). pH should be below 3,20, add 3g/hL SO2 and 4g/hL ascorbic acid. Mix. The day after, rack under CO2 protection (Racking #1). Wash the oak staves used during A.F., they follow the wine.

2 - Cool the wine down and maintain it at 10°C. Maintain Molecular SO2 between 0,9 and 1,1 mg/L. After a week of sedimentation, test for oxidasic breakdown and rack again under cover of CO2 (Racking #2). Wash the staves they follow the wine.

3 - Maintain below 10°C. Add a white-wine-specific ageing yeast (10g/hL Pure Lees Longevity). Maintain between 0,9 and 1,1 mg/L Molecular SO2. Mix once a week avoiding oxidation.

4 - After 3 weeks add 10g/hL Pure Lees Longevity, 1g/h Reduless and 1g/HL ascorbic acid.

5 - Wait a week without agitation, do an oxidase breakdown test and rack again (Racking #3). Remove the staves.

6 - Maintain below 10°C. Add again 10g/hL Pure Lees Longevity. Maintain Molecular SO2 between 0,9 and 1,1 mg/L.

7 - From this point on the wine can be blended with wines made from sound grapes and the laces is completely deactivated. If the wine must remain by itself, mix once a month, without oxidation. Each month, try and evaluate if it needs another addition of 10g/hL Pure Lees Longevity and 1g/hL ascorbic acid.

The goal of this whole action plan is to manage what laccase could potentially still be active, to manage the stability of the green colour, to manage the development of the fruity varietal aromas needed for this segment of price and avoid the development of sulfur-like off-smells and off-tastes and the development of aromas and flavours of earth and fungus.

Adjusting and maintaining the pH below 3,20is key in the concentration and the stability of the molecular SO2, the most efficient form of SO2. Low pH is also a key factor of the stability of the colloidal matrix of the wine and of the varietal aromas bound in that matrix. Such a pH allows to work with relatively low dosage of SO2. All the work done on A.F. to avoid yeast-produced SO2 and acetaldehyde gives the most of its positive effects in this situation. When you blend the wine you will have a wine perfectly protected with under 100 mg/L Total SO2.

Since 1995 studies have shown that adding both SO2 and ascorbic acid in the tank right when sugars are consumed followed by a racking the very next day is the most interesting technique to obtain the soundest, cleanest and longest-lived conforming varietal wine, even though the sulphite-reductase enzymes from the yeast can still be active. Also this protocol generates low amount of sulphur compounds, in the case of Sauvignon blanc just the necessary amount of varietal aromas. Lastly, our discovery of the unique effects of additions of Reduless at 1g/hL changed this first action at the A.F. to [SO2 + ascorbic acid + **Reduless** /1 day/ Racking] which brought yet an additional improvement to the first steps of ageing.

A temperature just below 10°C right from the start of ageing is a key-point to slow down the enzymatic oxidation phenomena and the phenomena of enzymatic liberation of negative sulphur compounds. This is very important to keep a wine fresh, clean, sound and with longevity. It is true that low temperature favours the compacting of lees however the program of rackings and agitations of this protocol easily remedies that.

Fractioned additions of Reduless, the first one at the same time as the first addition of SO2, allow to work on the pool of sulphur compounds slowly and in real-time for a clean, sound one with good longevity and the right expression of its varietal aroma. Combined with fractioned additions of ascorbic acid they are a great boost to the expression of varietal fruity aromas. Of course the dosage we propose not only stabilises the expression of thiols and even improves on it.

Pinking phenomenon in such a wine remains a menace for the enologist. All steps in this protocol takes into account these risks of pinking and the recommendations stem from our long experimental experience on the subject. Management of pinking risks is done step by step through the following actions:

-Obviously all actions of mixing and racking must be done in conditions preventing the entrance of oxygen into the wine. This is the base of the professional work on varietal white wines on the Popular Premium level.

-If the vineyard has been treated with lalVigne Aroma at veraison the risk of pinking in the winery is lowered, which is another advantage of using LalVigne Aroma.

-The early addition of Glutastar absorbe a part of the dangerous small-size polyphenols and its even more effective when combined with a low pressure to avoid extracting them in the first place.

-The addition of PVPP during the fermentation is one of the main tools in preventing pinking since it's te period of higher efficiency. The bentonite will complement the action of the PVPP even though its absorption is less specific of pinking -but still interesting in its early addition to remove unstable proteins .

-Starting at the end of consumption of sugars, the right program of addition of ascorbic acid is the most potent tool in preventing pinking in the wine. Of course you want to work in co-protection of the ascorbic acid by molecular SO2: SO2 protects the ascorbic acid and ascorbic acid protects SO2.

-During A.F. additions of Stimula Sauvignon and later of Pure Lees Longevity during ageing both adsorb some of the reactive and dangerous polyphenols responsible for the pinking, complementing the action of the PVPP. The adsorption happens on the insoluble fractions of the inactivated yeast.

-The staves we propose tu use and the dosage we propose also participate in the prevention of pinking, mainly for their sponge effect on the polysaccharides of the estructure of the wood. What's more the tanino of the oak that may pass in the solution of the wine don't have an amplifying affect on the pinking. Polyphenols of the grape and tannins from the oak both have very distinct influences on the pinking of white wines.

The different rackings are here to eliminate the heavy lees. Those heavy lees are particles that saturate a lot with quinones and oxidised catechins -both of which are motors of the oxidation chains- and bring aromas and flavours of fungus. This is why you ant to rapidly reach of low turbidity of the wine. Later you want to compensate by adding Pure Lees Longevity to build the colloidal matrix with macromolecules of the yeast without the risks the lees you removed would have presented. The first racking, the day after the first addition of SO2, removes extremely dangerous heavy particles early on -agglomerates of tartrates with oxidised polyphenols , particles of bentonite saturated with proteins and polyphenols, particles of PVPP saturated with polyphenols, insoluble particles of Stimula Sauvignon, Nutrient Bit Nature and reduless saturated with polyphenols, sulphur compounds and herbaceous aromas. For alarming it may sound, obviously it is better to have all these different sponges, now saturated with dangerous elements, that we can and must remove than to leave these dangerous compounds in suspension in the wine. Since all this particles are heavy they sediment perfectly during the first 24h hours following the first addition of SO2 and its homogenisation, and are thus very easy to remove.

Fractioned additions of ageing inactivated yeasts such as Pure Lees Longevity allow to absorb negative elements of the wine before they settle into the wine (yellow colour, earthy aromas, herbaceous aromas, drying and bitter sensations,…). These additions also build the colloidal matrix step by step with additional liberation of macromolecules. Considering that the maceration in the press has been shortened, you want to compensate a lower concentration in grape polysaccharides with more macromolecules of specific yeast. All of this is very important to clean the wine of potential problems and stabilise the green colour and the varietal fruity aromas.

The oak staves that follow the wine from the start of A.F. allow to remove step by step the negative elements of the wine (see above) through the sponge effect of the wood. Using specifically staves rather than smaller fractions of oak allow for a progressive adjustment of the fruity aromas and the mouthfeel of the wine. In the situation of a wine weaken by the contamination by *Botrytis,* it is even more important. Of course the varietal expression of the mineral fruit of a Popular Premium Sauvignon requires a certain work with oak but without covering these aromas with aromas of sawdust, vanilla or green wood (originating in poor choice of the oak to use).