



Controlling *Brettanomyces* during winemaking



Introduction

Brettanomyces is a type of yeast commonly found in wineries, which has the potential to cause significant spoilage in wines, through the production of volatile phenol compounds. These compounds (in particular 4-ethylphenol, 4-ethylguaiacol and 4-ethylcatechol) are associated with undesirable sensory characters such as 'Band-Aid', 'medicinal', 'horsey', and 'barnyard', which are collectively known as 'Brett' character. Because *Brettanomyces* can be found across all Australian wine regions, and can cause such negative sensory effects, it is sensible for all wineries to have a control strategy in place, even if Brett spoilage problems have not been experienced in the past. Steps taken to control Brett are also likely to have additional positive consequences in avoiding other

microbiological spoilage, volatile acidity (VA) and general wine instability problems.

The growth of *Brettanomyces* in wine is affected by a range of factors, some of which are interlinked. This means that controlling Brett requires a **multi-faceted approach**. If just one factor is addressed in isolation, it is unlikely to be successful. However, if action is taken across the range, the risk of Brett spoilage should be significantly reduced. The important factors in a Brett control strategy are outlined below.

General sanitation

Cleaning and sanitation in the winery are extremely important in controlling a range of microbial spoilage problems, by helping to prevent the build-up of unwanted yeast, bacteria or moulds. During vintage, care



should be taken to ensure that crushers, presses and must lines are cleaned and sanitised regularly (at least daily), so that populations of unwanted microorganisms can be kept at a minimum. Keeping processing equipment clean will also help prevent the accumulation of organic material which can provide a food source for microorganisms.

Tanks and barrels should be cleaned regularly to prevent microbial cross-contamination when wines are moved around. Additionally, the microbial status of any wines or barrels entering the winery, and wines used for topping barrels, should be ascertained.

Residual sugar

Brettanomyces growth is strongly favoured by the presence of residual sugar in wine. Therefore optimising the success of primary fermentation is an important measure in a Brett prevention strategy. The simplest ways to minimise residual sugar in red wine are to:

- have the strongest yeast starter culture possible by following supplier recommendations – especially with high sugar musts
- aerate the fermentation when it is most active – i.e. at least one aerative racking, or rack and return
- avoid temperature shock of yeast when pressing – aim to keep wines within two degrees of fermenter temperature for at least twelve hours during and post-pressing

It is also important to check residual sugar levels in red wines using an enzymatic assay, rather than assuming that primary fermentation is complete.

Sulfur dioxide (SO₂)

SO₂ is a very important wine additive, both in preventing microbial spoilage and in minimising wine oxidation and promoting wine longevity. Simply adding more SO₂ is not necessarily the best way to control Brett, although in some cases this is appropriate. Rather, it is better to use SO₂ in a way that is most effective. A more detailed discussion of SO₂ use in winemaking can be found in the AWRI's Technical review No. 145 (Revisiting sulfur dioxide use) – however there are some simple principles that can be applied to minimise the risk of Brett spoilage.

- To dramatically reduce the probability of microbiological problems, add some SO₂ at the crusher. Note that this will eliminate all yeast and bacteria so you will later need to inoculate for malolactic fermentation (MLF).
- When adding SO₂ to wine, remember that only about 35 to 40% is yielded as free SO₂ (the component that has antimicrobial activity) – so add enough to make a difference. One large addition is much more effective than several small additions.
- Don't forget about the relationship between free SO₂ and pH. The higher the pH of wine, the more SO₂ is needed to achieve the same antimicrobial effect.
- Wine is particularly vulnerable to microbiological spoilage during MLF, so it is a good idea to make a big SO₂ addition as soon as MLF is completed – and to do everything possible to help MLF go through quickly. More SO₂ is lost from new barrels than old barrels, so take this into account.
- SO₂ is less effective when added to wines with high turbidity. This doesn't mean that SO₂ shouldn't be added to hazy wines, but



if it is, more will be needed to have the same effect. It also means that working to maintain low turbidity throughout wine maturation will reap benefits.

- The ratio of free to total SO₂ is a useful winemaking tool and is worth monitoring.
- During even the most careful transfer of a wine, 5 mg /L of free SO₂ can be lost.

pH

Brettanomyces growth is favoured by high pH; however this is predominantly due to the relationship between pH and SO₂ effectiveness. At the end of MLF wines are usually at their highest pH and lowest SO₂ concentration, which makes this a critical time for potential *Brettanomyces* growth and wine spoilage. It is recommended that winemakers clarify red wines and make a single large SO₂ addition as soon as possible after MLF, rather than a series of smaller additions.

Barrel sanitation

While barrel sanitation should be an important component of any Brett control strategy, it is crucial to remember that **barrel sanitation alone will not solve a Brett problem**. Additionally, any effort put into barrel sanitation will be wasted if the barrels are re-contaminated with wine containing a high population of *Brettanomyces* yeast.

A wide range of barrel sanitation methods are used in wineries around the world, including: cold and hot water rinses, filling with SO₂ solutions, steam cleaning, ozone, ultrasonics, microwaves and even blasting with particles of dry ice! To remediate known contaminated barrels the AWRI recommends heat as the most effective and practical sanitation

method; that is, **filling barrels with hot water of at least 85°C** and leaving the hot water in the barrels for at least 15 minutes (AWRI publication #756), ideally until the outside of the barrel is hot to touch.

Barrel topping

In many wineries, the wine used for topping barrels can be a potential source of *Brettanomyces* contamination. It is commonly poorly stored –very often on ullage and without any additional SO₂. Simple steps taken to ensure that topping wine is stored carefully, and is maintained at a suitable level of SO₂ to prevent microbial spoilage could prevent widespread wine contamination.

New barrels vs old barrels

While it might be commonly assumed that older barrels pose greater risk, due to the possibility of *Brettanomyces* yeast having become established in the old wood, it should be remembered that all other things being equal, wine stored in new barrels will lose SO₂ faster than wine stored in older barrels. This factor should be taken into account for wine going into new barrels, or recently cleaned barrels, to ensure that SO₂ concentrations are maintained at high enough levels to inhibit microbial growth.

Filtration and clarification

Wines with high turbidity are generally at a higher risk of microbial spoilage (including Brett) than those with lower turbidity. This is due, at least in part, to the influence of high turbidity on SO₂ effectiveness. It is important, when confronted with a hazy wine, to determine what components make up the haze, rather than simply to assume that the



haze is benign in nature. If a haze is found to contain viable microorganisms, then filtration of the wine before bottling is highly recommended. While some winemakers seem hesitant to filter red wines, it is the AWRI's position that a well performed filtration is a much better option than taking the risk of post-bottling microbial spoilage.

Reference and further reading

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AWRI Commercial Services also offers a Brett audit service. For more information, please contact Commercial Services (commercialservices@awri.com.au).