Keep an eye out for Brett

Growth of *Brettanomyces* yeast during wine maturation is associated with production of volatile phenols that impart 'medicinal' and 'barnyard' aromas. Commonly known as 'Brett' character, these aromas are typically combined with a metallic aftertaste.

It has been some time since the Australian wine sector experienced widespread Brett problems – for those with short memories, during the late 1990s and early 2000s most Australian Cabernet Sauvignon wines contained high levels of Brett spoilage compounds (4-ethylphenol [4-EP] and 4-ethylguaicol [4-EG]), sufficient to negatively affect consumer liking (AWRI publication #1043). Widespread adoption of a practical Brett control strategy (AWRI publication #756) saw typical 4-EP levels in wines from major Cabernet Sauvignon-producing regions fall from ~1000 ppb for vintage 2000 to less than 100 ppb (the perception threshold for 4-ethylphenol ranges from 300 to 600 ppb, depending on wine style) by vintage 2005.

During the past year the AWRI helpdesk and AWRI Commercial Services have observed a spike in queries regarding Brett spoilage, relative to other topics, with the proportion of queries reaching similar levels to those seen during the early 2000s (Figure 1).

This may, of course, reflect greater vigilance and proactive behaviour in 2013, rather than an emerging problem. Nevertheless, it seems timely to revisit the key factors that are important in controlling Brett, and emphasise that Brett is not just a Cabernet Sauvignon problem.

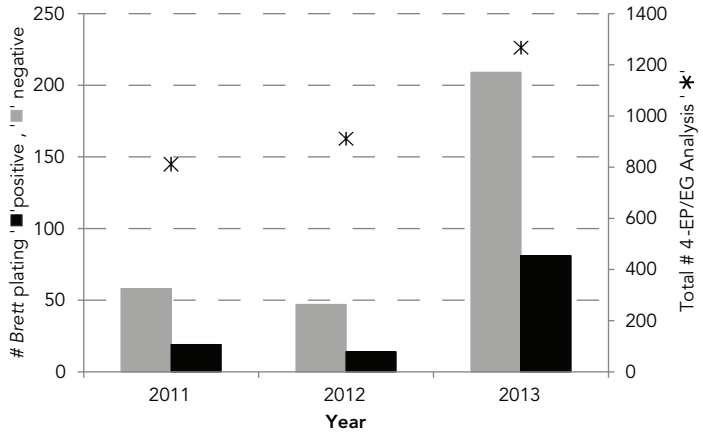

Figure 1. Number of requests for Brett plating and 4-EP/EG analysis received by AWRI Commercial Services, 2011–2013. The increased sample submissions coincide with increased probability of detecting *Brettanomyces* in wines, as reflected by increased number of positive (■) *Brettanomyces* plating results. ✳ indicates the number of samples received for 4-EP/EG analysis.

Brett control

The growth of *Brettanomyces* yeast in wine is affected by a range of factors, some of which are interlinked. For this reason, Brett control is best achieved by application of a holistic strategy – rarely will a Brett problem be solved by addressing one risk factor in isolation. Three of the most important factors in a Brett control strategy are outlined below and elaborated upon, with others, in the AWRI Factsheet – Controlling *Brettanomyces* during winemaking.

Sanitation

Cleaning and sanitation in the winery are important in controlling a range of microbial spoilage problems, by helping to prevent the build up of unwanted yeast, bacteria and moulds. During vintage, care should be taken to ensure that crushers, presses and must lines are cleaned and sanitised regularly, ideally at least daily.

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

Residual sugar

While *Brettanomyces* can use a range of sugars for growth, including those present in oak barrels, its growth is strongly favoured by the presence of residual glucose/fructose in wine. Some ways to minimise residual sugar in red wine include: preparing starter cultures according to manufacturers' instructions, aerating fermentations when most active, and avoiding temperature shock of yeast when pressing. In high sugar musts it is also important to consider appropriate yeast nutrition.

Critically, do not assume a wine is dry – check residual sugar levels using an enzymatic assay. As little as 0.5 g/L of glucose/fructose is sufficient for a *Brettanomyces* population to grow and noticeably spoil wine while higher levels increase the risk of rapid spoilage.

Sulfur dioxide (SO_2)

SO_2 is a very important wine additive, both in preventing microbial spoilage and in minimising wine oxidation and promoting wine longevity. Addition of SO_2 at the crusher dramatically reduces the probability of Brett and other microbiological problems throughout winemaking. When adding SO_2 to wine, only 35 to 40% is yielded as free SO_2 (the component that has activity against *Brettanomyces*) – so it's important to add enough to make a difference. One large addition is much more effective than several small additions, and the largest addition should be made immediately after MLF has completed as this is when wine is most vulnerable to Brett growth.

To reduce the risk of Brett spoilage, aim to achieve molecular SO_2 levels of 0.6-0.8 mg/L, which equate to 30–40 mg/L free SO_2 at pH 3.5. The higher the pH of wine, the more SO_2 is needed to achieve the same antimicrobial effect. The more turbid a wine is, the more SO_2 may be needed to achieve an effective level, and when establishing a barrel monitoring regime consider that SO_2 is lost more quickly from new barrels than old barrels.

Recent AWRI winery Brett audits have highlighted the importance of the management factors outlined above. Comparative case studies have found associations between poor hygiene practices and the detection of live Brett cells throughout wineries. In contrast, in wineries with stringent sulfur regimes, high hygiene levels and adequate risk management, no live Brett cells have been detected. Having adequate sulfur regimes and good sanitisation practices for both red and white wines is crucial to controlling Brett populations in the winery.

Brett – not just a problem in red wines

All red varietals can be affected by Brett, particularly styles matured in oak barrels, but it doesn't mean that how we perceive Brett character will be the same. In Cabernet Sauvignon and Shiraz, the two key spoilage compounds 4-EP and 4-EG are present at a ratio around 10:1, although this can range from 30:1 to 5:1. The presence of 4-EG imparts more 'spicy' and 'clove-like' aromas, but also has a much lower perception threshold and therefore affects wines at lower concentration. This is one reason why Brett is particularly obvious (if present) in Pinot Noir, where the typical ratio of these compounds is around 2:1 to 3:1. It is also one of the reasons why sparkling wines with Pinot Noir as a base can be noticeably Brett-affected with very low 4-EP levels.

Yes, Brett can be a problem in sparkling wine! In fact, the first *Brettanomyces* wine isolates came from sparkling wine in Germany in 1912. Brett can also occur in white wines because the precursor compounds for 4-EP and 4-EG are present in white wines as well as reds. The AWRI has isolated *Brettanomyces* from barrel-fermented Chardonnay and tank-fermented Riesling. The main reason Brett isn't seen as often in white wines is that on average they have lower pH and therefore higher molecular SO_2 levels. High-solids, spontaneous barrel fermentations lower some of the barriers to *Brettanomyces* growth – it would be advisable to keep a closer eye on such wines, particularly if they are sluggish and contain high levels of residual sugar.

The issue of Brett has never gone away; at best it has been tamed and controlled in many wineries, but it is always waiting to take advantage of the unwary. As with any risk, constant awareness and appropriate mitigation measures are the best way to ensure that Brett does not get out of hand again. The lessons learned from the previous widespread Brett problems

have ensured that there is now a thorough understanding of the risk factors for Brett and the best methods of prevention.

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