Are there 'good' *Brettanomyces* strains?

The yeast species *Dekkera (Brettanomyces) bruxellensis* is well known for its capacity to cause significant spoilage of wines. This is caused through the production of volatile compounds, such as 4-ethylphenol, which impart classic 'medicinal', 'elastoplast' and 'barnyard' aromas – otherwise known as 'Brett character'. Are all *Brettanomyces* strains 'bad' though? This question can be broken into three components: do all 'Brett' strains make 4-ethylphenol; can they make other (desirable) volatile compounds; and are any of them less likely to spoil wine?

Previous work at the AWRI used a DNA-marker methodology to determine that there were seven *Dekkera bruxellensis* strains found across 31 winemaking regions of Australia (AWRI publication #989). In fact, 98% of the isolates studied fell into just three genetic groups, known as genotypes I, IV and V. In a recent publication arising from an AWRI-University of Adelaide collaborative project (AWRI publication #1550), representatives of these groups were grown in a model wine medium and their relative capacity to make 4-ethylphenol and 4-ethylguaiacol was determined (Figure 1). All three strains converted aroma-less precursors in the medium to these volatile phenols with similar efficiency. By this measure alone, at least 98% of *Brettanomyces* in Australia could be considered 'bad'.

The production of other aroma compounds by these strains was also examined. All three showed similar tendencies, for example, 'fruity' acetate esters such as 3-methylbutyl acetate were degraded, while 'cheesy' or 'rancid' volatile fatty acids were produced. There were differences in the overall volatile profiles for model wines in which these strains were grown, in the same way that wine made with different *Saccharomyces cerevisiae* wine yeast, or malolactic bacteria, differ. The net effect of these volatile profile differences resulted in the wines being perceived as sensorially different (Table 1), at least for the two 'most different' strains, AWRI1499 and AWRI1613. This sensory difference was, however, overridden when moderate levels of 4-ethylphenol and 4-ethylguaiacol were spiked into this pair of

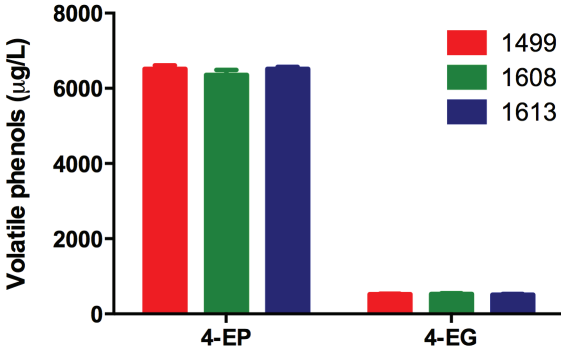

Figure 1. Formation of 4-ethylphenol (4-EP) and 4-ethylguaiacol (4-EG) for three *D. bruxellensis* strains (AWRI1499, AWRI1608 and AWRI1613) grown in model wine medium. Values are mean determinations of triplicate fermentations. Error bars indicate standard deviation'

Table 1. Results of duo-trio analyses for model wines that underwent secondary fermentation with three *Dekkera bruxellensis* strains AWRI 1499, AWRI 1608 and AWRI 1613. Asterisk denotes statistically significant comparisons according to 95% confidence interval.

Treatment		**Unspiked**	
Pair	1499 v 1608	1608 v 1613	1499 v 1613
Correct	21	21	23*
Incorrect	11	11	9
Total	32	32	32
Treatment	**Spiked (300 µg/L 4-ethylphenol, 30 µg/L 4-ethylguaiacol)**		
Pair	1499 v 1608	1608 v 1613	1499 v 1613
Correct	18	16	21
Incorrect	14	16	11
Total	32	32	32

model wines. In other words, the impact of volatile phenols on wine sensory properties far outweighed any other changes to volatile profiles resulting from different *Brettanomyces* strains growing in wine.

Do any of these strains present greater risk of wine spoilage? In this study it was evident that AWRI1613, a representative of the genotype IV grouping, grows faster in model wine. Preparation of intentionally spoiled red wines for presentation at the 'Microbial Spoilage' workshop held at the 15th Australian Wine Industry Technical Conference (July 2013) reinforced this characteristic: the first wines ready for the workshop (i.e. showing high 'Brett' levels) were inoculated with AWRI1613. On the other hand, the most common genotype group found across Australia (85% of all isolates, represented by AWRI1499) has been shown to tolerate higher levels of sulfite (AWRI publication #1447). Different winemaking practices and wine composition will favour growth of different strains; nonetheless the overall risk posed by sulfite-tolerant strains is greater due to the dearth of other preservative options. Vigilant application of the AWRI's holistic 'Brett' control strategy remains the best form of defense against all known *Brettanomyces* strains, and this strategy will be updated as part of a newly GWRDC funded AWRI-University of Adelaide project over the coming years to ensure its continued efficacy.

References

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