

ARC Training Centre for Innovative Wine Production

Technical note

WATER INTO WINE: PRE-FERMENTATION STRATEGIES FOR PRODUCING LOWER ALCOHOL WINES

Introduction


Warmer grape ripening periods as a result of a changing climate can pose considerable challenges for Australia's winemakers. Logistical pressures due to a compressed vintage can lead to delays in harvesting that further increase berry sugar levels, yielding wines with elevated alcohol concentrations. Trying to manage heterogeneous berry ripening, by delaying harvest while waiting for flavour and phenolic ripeness, can result in increased berry shrivel contributing to increases in wine alcohol concentration.

Winemakers often need to moderate wine alcohol content for a number of reasons, including to enhance wine quality and balance, meet consumer demand, and avoid paying higher taxes or duties on exports. Various approaches are available for lowering wine alcohol content, either before, during or after fermentation [1], and we sought one that would be easy to adopt. As a result we investigated an early harvest regime and a blending approach for Cabernet Sauvignon using either "green harvest wine" (GHW) or water to substitute for some juice prior to fermentation [2]. The inclusion of water to dilute initial sugar must levels was very timely in light of the recent decision [3] to permit the addition of water to high sugar musts to facilitate fermentation [4].



The key outcomes

The 2015 growing season in McLaren Vale was warmer than the long-term average and berry shrivel was evident, making it a very representative season in terms of compressed grape ripening. Berries picked at later time points for the harvest series wines revealed a proportional increase in the number of berries with high sugar and a greater degree of ripeness heterogeneity (with around 10% of berries having > 35 °Brix for the commercial harvest time point, which acted as the control). Water and GHW



(4.5% alcohol by volume [abv] and pH 2.76), produced from grapes picked at about 8 °Brix, were also used to blend with the must arising from grapes harvested at commercial maturity, after running off a proportional amount of juice. The harvest series experiments produced wines ranging from 11.4% abv for the first harvest to 18.2% abv for the control, whereas blending yielded wines with around 14.5% abv for treatments containing 30-40% GHW or water by volume, and up to 17% abv for wines made with 10-14% GHW or water. A range of grape and wine compositional measures important to red wine quality were undertaken during this study, including colour, phenolics and polysaccharides.

Polysaccharides that contribute to fullness and decrease astringency were found to increase with maturity for wines from the first three harvest time points but declined markedly by the time of commercial harvest, when berry shrivel was more evident. Wine anthocyanin concentrations increased sharply for the earlier harvests and then stayed relatively stable whereas wine colour density, total phenolics and stable pigments continued to increase in line with the grape ripeness. The effect of the treatments was magnified after 18 months in bottle, with the later harvest points apparently showing better ageing potential by having higher levels of anthocyanins, stable pigments and colour density. Wine tannins, which were very well-correlated with grape extractable tannin [5], showed an increasing trend with ripeness and a considerable spike in concentration for the last harvest time point.


Blending the must with water or GHW in high proportions resulted in increased polysaccharides in the wines, although polysaccharide sugar composition was affected by the blending material and the amount incorporated. There were no differences in wine colour density, total anthocyanin concentration, total phenolics or wine tannins for the blending treatments compared to the control, but a high proportion of GHW or water decreased stable pigments. However, after 18 months in bottles stable pigments did not differ among the treatments, which makes the blending approach promising from a wine ageing perspective.

Recommendations

Overall, large decreases in final wine alcohol concentration can be readily achieved purely through a pre-fermentation approach. Due to its ubiquitous availability and minimal impact on wine composition, the implementation of water was found to be the most convenient way to decrease wine alcohol content in this study on Cabernet Sauvignon. However, because this approach tends to retain the compositional attributes determined by grape maturity at the time of harvest time, it could be regarded as a useful last resort to limit the negative implications of a highly mature crop, rather than being broadly implemented after deliberately prolonging the maturation of grapes on the vine.

What's next?

A more complete evaluation of the influence of these treatments on the style and quality of wines made in 2015 has been undertaken, with the analysis of volatile composition and sensory profiles to be reported in a subsequent publication. Whereas the first vintage only comprised Cabernet Sauvignon, the experimental winemaking was repeated in 2016 with both Cabernet Sauvignon and Shiraz. In that follow-up work, there was a focus on evaluating the suitability of GHW or water blending approaches to manage wine alcohol concentrations under more moderate harvest conditions with the absence of severe berry shrivel, therefore accounting for year-to-year variations winemakers frequently face in light of climatic changes. Supporting the observations made during the 2015 trials, the outcomes in 2016 strongly underscore the advantages of water implementation, but also raise more questions about the best way to do so. A more convenient way for winemakers to dilute must sugar concentrations is the simple addition of water without running off juice, hence in 2017 the experimental setup was designed to evaluate dilution or substitution with water as tools to manage



wine alcohol levels while retaining optimum wine quality. In addition, the 2017 trial sought to understand how the stage of grape maturity may influence attempts to lower wine alcohol concentrations, by picking fruit at two distinct maturity levels described as ‘fresh fruit’ and ‘mature fruit’, thus completing these investigations of an early harvest regime and blending approaches to manage alcohol levels in red wines.

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