Water into Wine!

Assessing the suitability of pre-fermentative water addition or substitution to manage alcohol concentrations of Cabernet Sauvignon and Shiraz wines

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Introduction

- Food Standards Australia New Zealand approved pre-fermentative addition of water to manage wine alcohol levels from ≥15.0 to a minimum of 13.5 Baumé.[1]
- This technique may help winemakers:
  - adapt to climate change related higher grape sugar levels at harvest
  - overcome logistical issues due to harvest compression
  - by providing flexibility in producing alcohol adjusted wines
- This study observed the effect of pre-fermentative water addition on red wine quality parameters over three distinct vintages

Material and Methods

- Wines with adjusted alcohol levels were produced from **Cabernet Sauvignon** (2015 and 2016) and **Shiraz** (2016 and 2017) sourced from McLaren Vale, Australia
- The liquid-to-solid ratios were unaltered by **substituting** removed juice with equal amounts of water
- 7 days skin contact, two punch downs/day, fermentation to dryness
- In 2017, lower alcohol **Shiraz** wines were produced with juice **substitution** or **dilution** with water (increasing the liquid-to-solid ratio)
- Wines were profiled for colour, tannin and volatiles as well as for their sensory properties using a descriptive analysis panel

Results and discussion

- Colour and polyphenol characteristics remained largely unchanged in lower alcohol **Cabernet Sauvignon** wines made by substitution in both vintage conditions of 2015 and 2016 (Figure 1)
- **Cabernet Sauvignon** aroma and flavour intensities remained constant with higher water implementation rates, as well as the presence of important descriptors like 'Red fruit' and 'Dark fruit'
- Sensory attributes related to over-maturity (vintage 2015) like 'Hotness' or 'Dried fruit' were retained in lower alcohol level wines. Implementation of water to manage wine alcohol level may not be a cure for delayed harvest in a hot year

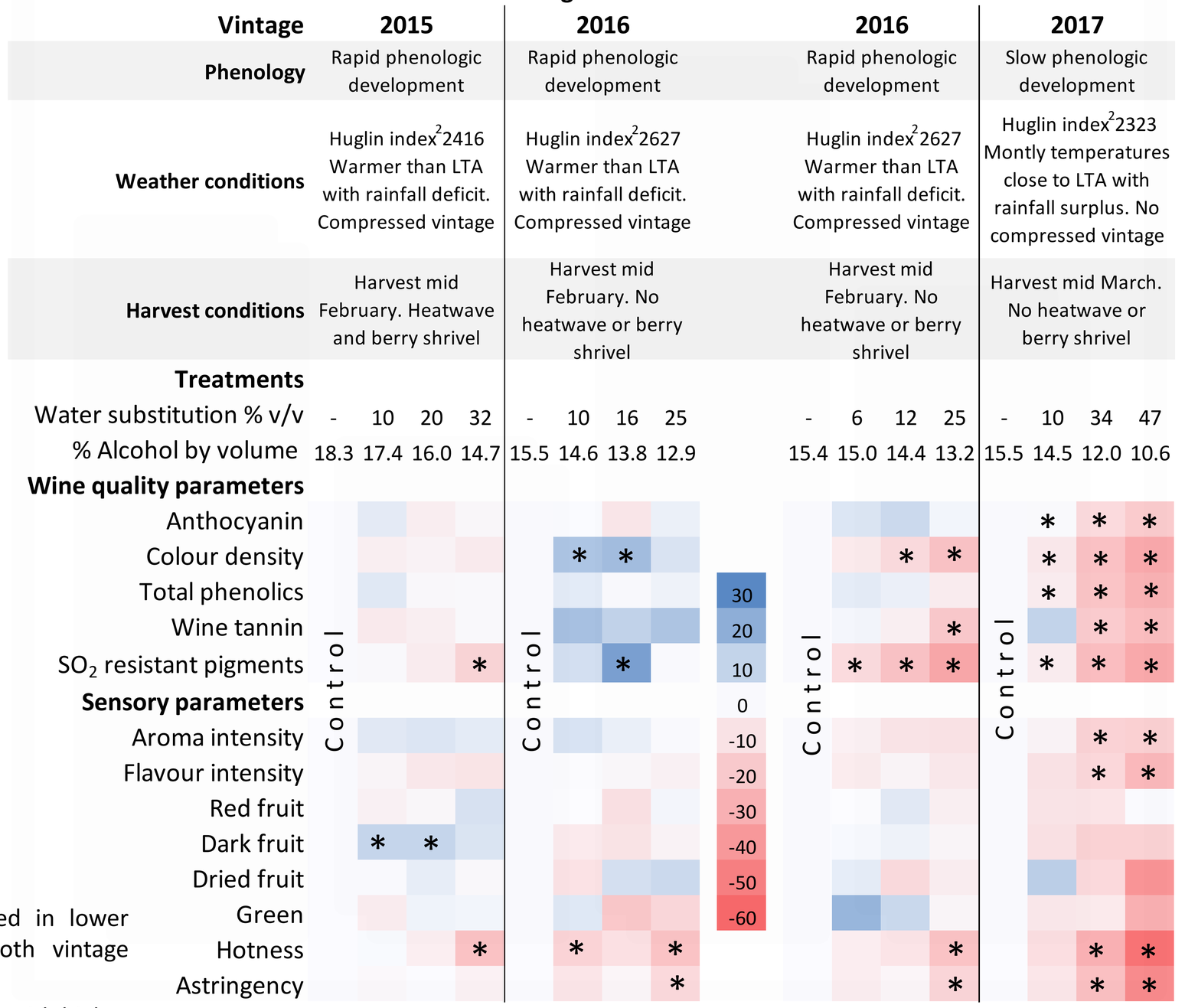

Figure 1 Water substitution across two vintages. Normalised data (mean of 3 replicates) of wine compositional and sensory parameters represented in heat maps. Colouring indicates the difference to the control wine (blue= increasing values, red=decreasing values). * indicates significant difference to control ($p<0.05$, one way ANOVA, post hoc Fisher's LSD).

- Colour density, tannin and SO_2 resistant pigments of **Shiraz** wines were more sensitive to the alcohol management treatment, showing lower values at lower established ABV levels in 2016 and 2017 (Figure 1)
- Aroma and flavour intensities of lower alcohol **Shiraz** wines decreased, indicating a more significant change in wine style as in the **Cabernet Sauvignon** wines in 2016
- **Shiraz** wine colour and tannin composition were compromised more with 10% water implementation in 2017 than in 2016. Vintage dependent grape extraction dynamics may play into this phenomena

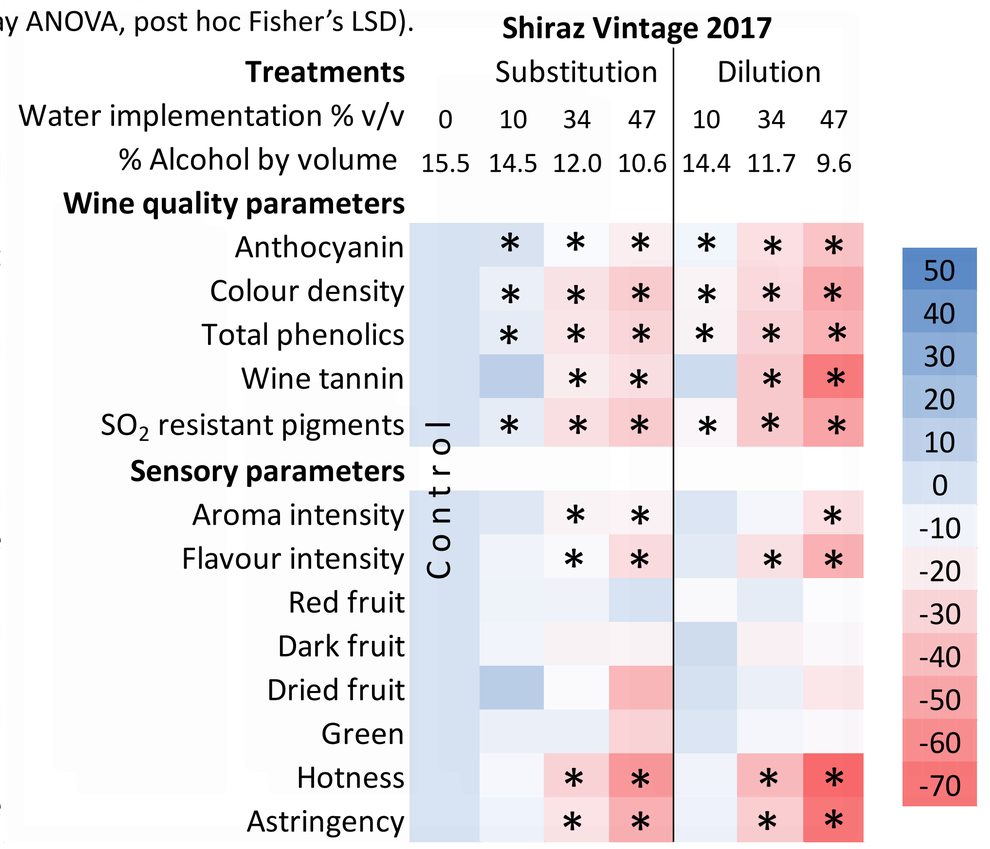

Figure 2 Comparison of the effects on wine compositional and sensory parameters as a function of water implementation via substitution or dilution. Normalised data (mean of 3 replicates) of wine compositional and sensory parameters represented in heat maps. Colouring indicates the difference to the control wine (blue= increasing values, red=decreasing values). * indicates significant difference to control ($p<0.05$, one way ANOVA, post hoc Fisher's LSD).

Conclusion

- When working within the legal limit imposed by FSANZ, the pre-fermentative water implementation via juice substitution may be a feasible technique to manage wine alcohol levels while preserving wine style determined by grape quality and composition
- A more severe change in wine style in response to the water implementation may be expected with Shiraz compared to Cabernet Sauvignon, particularly in relation to wine colour and tannin composition
- For water additions less than 10% v/v, no obvious advantage is observed between juice substitution and dilution
- At water implementation rates beyond 10% (corresponding to approx. −1% ABV), wine style may be more successfully preserved by maintaining constant liquid-to-solid ratios through substitution (Figure 2)

References

1. FSANZ. (2016). Food Standards Australia New Zealand, Application A1119 – Addition of water to facilitate wine fermentation. *2018*
2. Tonietto, J.; Carbonneau, A., A multicriteria climatic classification system for grape-growing regions worldwide. *Agricultural and Forest Meteorology* **2004**, *124*, 81-97.

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