Positive sensory and chemical outcomes from oxygen addition during red wine fermentation

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Background

- The deliberate addition of oxygen during red fermentation:
  - can attenuate reductive odours
  - can soften tannin
  - is most useful in closed vessels e.g. rotary fermenters

- Benefits to industry are:
  - producing wine market-ready earlier
  - reduction in N-based nutrients required
  - brighter and more fruit-forward wines
  - making wines that do not tend to become reductive over time in bottle

Results and key points

- Biggest impact with long duration treatment, demonstrating the impact of oxygen delivery timing
- The low flow-rate treatment was associated with the following chemical attributes:
  - decreasing tannin size (A)
  - increasing concentration of branched (B) and small-chained esters
  - no impact on low molecular weight sulfur compounds (C) or fermentation rate.
  - decreasing concentration of medium-chained esters (D)

The sensory analysis shows:
- continuous, low flow resulted in most red fruit flavour
- repeated treatment enhanced aromas of red fruit, floral, confectionary and increased perception of acidity
- single treatment resulted in more dark fruit flavour, astringency, opacity (colour density)
- no treatment resulted in a ‘drain’ aroma

Conclusions

- The amount of oxygen exposure is important to drive compositional change in finished wine.
- The way that oxygenation treatments are applied can be just as influential.

Aim

To determine whether it is the amount of ferment aeration or the way that a ferment is aerated that is the biggest contributor to wine composition and sensory properties

Experimental design

- Aeration treatments applied with variations to timing of addition but equivalent overall oxygen exposure
- 2018 Shiraz grapes from McLaren Vale, SA
- Vinification in pilot-scale fermenters (500 L)
- Air flow rates:
  - Low = 0.9 L/min
  - Standard = 9.0 L/min
- Air added using in-tank spargers (12 x 2 µm sinters; 22 mm x 17 mm Ø)