INTRODUCTION

Background:

- Oxygen is a key nutrient in the context of fermentation, despite wine fermentation being conducted largely anaerobically.
- Supplementation of fermenters with oxygen has been shown to be beneficial to fermentation progress, especially if added during exponential growth.

Oxygen during fermentation:

- Using small (250 mL) and pilot scale (500 L) fermentations the impacts of oxygen addition at different stages of fermentation on fermentation performance and sensory characteristics of Chardonnay were evaluated.

RESULTS

Effect of oxygen concentration and duration of delivery on fermentation duration:

- Figure 1 shows yeast growth and fermentation kinetics in 250 mL Chardonnay fermentations which were aerated by sparger from day 2 as follows:
  1. 2h with 5% air
  2. 2h with 50% air
  3. 24h with 1% air
  4. 72h with 1% air
- Previous experiments had determined that overall oxygen uptake was similar for treatment pairs 1 + 3, and 2 + 4.
- This experiment shows that total oxygen input rather than the time over which it is delivered is the main driver of performance improvement.

Effect of timing of oxygen addition:

- Air was added to 250 mL Chardonnay fermentations (50% air at 5 mL/min for 2h) at four different time points and compared to no addition.
- All treatments reduced fermentation times. Addition of air as late as 9 days post-inoculation (30% of initial sugar) still mitigated the worst effects of oxygen limitation (Figure 2).

CONCLUSIONS

- The effects of oxygen are predominantly governed by the total oxygen exposure rather than the period over which a ferment receives that oxygen.
- While the maximal performance impact of oxygen occurred with an addition at 90% of initial sugar, effects could be detected even with late additions.
- There was minimal effect on the sensory profile of wines made with oxygen additions during fermentation, even with late oxygen treatments.