

Adding oxygen during fermentation reduces additives and intervention

Summary

Work undertaken at Yalumba Family Winemakers 1849 by senior process engineer Luke Wilson and winemaker Matt Zadow, proves the benefits of adding oxygen during fermentation for a minimal intervention approach to winemaking. The trial is using different fermenter designs to reduce yeast stress by adding air at different fermentation stages. The aim is to prevent reductive aromas and reduce the addition of compounds they are trying to avoid, such as diammonium phosphate (DAP). As a result of the trials so far, Luke said that the wines with added oxygen have had a reduced requirement for DAP. 'It's changing the way we think about nutrient addition. And it's further challenging us to think about the whole winemaking practice.'

Name	Luke Wilson and Matt Zadow
Business	Yalumba Family Winemakers 1849
Production type	Wine making
Wine region	Barossa, South Australia

Luke Wilson is senior process engineer at Yalumba Family Winemakers and supports the design, supply, construction and realisation of processes that enable winemaking. Actively involved in research and development (R&D) activities and projects, Luke is

working with the winemaking team, including winemaker Matt Zadow, to develop the company's philosophy of minimal intervention winemaking.



A recently completed Australian Wine Research Institute (AWRI) research project¹ funded by Wine Australia demonstrated that there were benefits to adding oxygen to red ferments. These included removing the need to add nitrogen supplements (a significant cost saving in itself) and the prevention of ‘low levels of sulfidic off-odours, bringing “bright fruit” characters to the forefront of the wine bouquet’ (Smith, P., 2017). It also concluded that ‘softening of tannins may reduce maturation time before bottling and make the wine available for market several months earlier.’

Over the past few years, Luke and the winemaking team have been adopting research outcomes from this project by using oxygen to minimise the formation of ‘reductive’ (sulfidic) aromas and to decrease the addition of DAP as a supplementary nitrogen source for yeast health during fermentation.

He said that their work is complementary to research on wine quality improvements and tannin structures being undertaken at the AWRI². The AWRI is focusing on white and red wine while the team at Yalumba have primarily focused on red.

Currently in the implementation stage, Luke explained that they are reducing yeast stress by adding air at different fermentation stages to prevent reductive aromas and reduce the need for additives, which they are trying to avoid. ‘We are also looking into the instrumentation to help predict when to add the oxygen during the fermentation process and assessing the resulting impact.’

The AWRI project investigated the mechanisms by which air could be practically introduced to fermenters of different size and design. At Yalumba, this has resulted in trialling different modifications to fermenter designs including the rotary and Sweeping Arm Potter (SWAP) fermenters. Luke said, ‘The rotary [fermenter] has a history of being reductive and we developed an automated system to add oxygen. The barrier was the vessel rotates itself, so we had to redesign the rotary coupling for the vessel.’

Luke said that initial trials relied on lock-out to prevent rotating which has an impact on the level of labour input. ‘We’re trying achieve the addition of air without additional work during fermentation to make the process viable.’

With the SWAP fermenters, because it is essentially a closed system, Luke said they looked at different options to actively introduce air into the vessel. ‘The Venturi



injector and pump-over lines were not effective due to pressure drops and required a redesign of pumps to implement.’

Instead, Luke said they are looking at adding air directly via an in-line sparger. Despite concern about a potential build-up of fermentation solids requiring pipe cleaning, this would be more effective at adding in air throughout the fermentation process. ‘The latest research is suggesting that small continuous air addition has a better outcome than larger additions, so we are looking at implementing this next year.’

As a result of the trials so far, Luke said that the wines with added oxygen have required fewer DAP additions, reducing cost and increasing confidence in robust fermentations with preferred sensory outcomes. ‘It’s changing the way we think about nutrient addition and it’s further challenging us to think about the whole winemaking practice, in that maintaining yeast health during fermentation can be just as important as picking the grapes at the right time for the winery’s specification, to get the best representation of the vineyard in the final wine.’

¹ Influencing wine style through management of oxygen during winemaking – AWRI 3.3.2

² Wine Australia and AWRI are in a long-term partnership covering research, development and extension (RDE) activities at the AWRI from 2017–25.

As the work has been ongoing for a couple of years, Luke noted that some benefits (including the use of smaller volumes of additives, aromatically brighter ferments, and no reductive issues) have been realised and then become expected as activities have progressed.

He explained their next steps. 'Initially we looked at oxygen cylinders, now we're looking at adding air over oxygen as it would be an easier, safer and more cost effective approach. It's also a more realistic path to implementation than using pure oxygen on all vessels.'

Luke believes that the best method for implementing the process and to minimise risk and improve quality, would be to have it at the point where it can manage itself, without operators intervening. 'As we know with vintages, labour and time are limited and things can be forgotten. It needs to be able to look after itself.'

The research outcomes from this project (investigating oxygen addition during fermentation) is helping the Yalumba winemaking team realise its goals of looking after the whole process and pushing to minimise additions.

Luke said, 'For us the focus has always been about trying to work within our philosophy – minimal intervention and less additives.'

Resources

Day, M. (2015). *Ways to introduce oxygen into an active red ferment*. [Fact Sheet] Adelaide: Australian Wine Research Institute. Available at: https://www.awri.com.au/wp-content/uploads/2015/02/introducing_oxygen.pdf.

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The Australian Wine Research Institute. (2019). *Influencing wine style and efficiency by managing oxygen during wine production*. [online] Available at: https://www.awri.com.au/research_and_development/2017-2025-rde-plan-projects/project-3-1-5/

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Wilson, L. (2018). *Practical Oxygen Management in the Winery*. [Conference Presentation] South Australia: 2018 WEA South Australian Conference Program. Available at: https://s3.amazonaws.com/wea-website-files/2018_WineEng_SA/Yalumba+-+Luke+Wilson+-+Practical+Oxygen+Management+in+the+Winery+-+Oxygen+Management+Forum.pdf

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