Australian Wine Research Institute

Annual Report 2024

AWRI

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The Australian Wine Research Institute Ltd was incorporated on 27 April 1955. It is a company limited by guarantee that does not have a share capital, and is a registered charity with the Australian Charities and Not-for profits Commission.

The Constitution of The Australian Wine Research Institute Ltd (AWRI) sets out in broad terms the aims of the AWRI. The AWRI's activities are then guided by its mission, values and behaviours.

Mission

Supporting the Australian grape and wine industry through world-class research, practical solutions and knowledge transfer.

Values

Values provide guidance in how AWRI will deliver on its mission. AWRI's values are:

- Excellence
- Integrity
- Passion

Behaviours

The behaviours that support our values are:

Excellence

- Outcomes focused, delivering results
- Personal mastery – being the best one can be
- Asking and answering the right questions
- Relevant to industry
- Collaborating to achieve faster, better or cheaper outcomes

Integrity

- Accountability to stakeholders
- Dealing honestly, impartially and consistently
- Scientific and professional rigour

Passion

- Enthusiasm for our people, our industry and our products
- Spirit of creativity
- Enjoying work and celebrating achievements
- Desire to do better
- Pursuing knowledge and understanding

Location

AWRI's laboratories and offices are housed in the Wine Innovation Central Building within an internationally renowned research cluster on the Waite Research Precinct at Urrbrae in the Adelaide foothills. Grape and wine scientists from other organisations are co-located with AWRI in the Wine Innovation Central Building.

The Waite Research Precinct is also home to other research and teaching organisations including: Australian Genome Research Facility, Australian Plant Phenomics Facility, CSIRO, South Australian Research and Development Institute (SARDI), the University of Adelaide's School of Agriculture, Food and Wine and the Waite Research Institute.

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Acknowledgements

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AWRI acknowledges the Traditional Owners and Custodians of Country we work on throughout Australia. We recognise their continuing connection to land, waters and culture. We pay our respects to Elders past, present and emerging and extend that respect to all Aboriginal and Torres Strait Islander peoples.

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Presented to the Australian grape and wine community

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Introduction

Variable climatic conditions and ongoing financial pressures were the hallmarks of the Australian grape and wine industry in 2023/24. After the extremely low vintage in 2023 (1.32 MT), 2024 saw a small increase in total yield. Wine Australia's national vintage survey estimated an Australian wine-grape crush of 1.43 million tonnes, 9% higher than 2023 but still 18 per cent below the 10-year average of 1.73 million tonnes. This was the third vintage in the past five years below the long-term average. Weather-related factors contributed to the low vintage, including events such as flooding, hail, frost, strong winds affecting flowering, and heatwaves. In addition, ongoing economic factors (including low grape prices, reduced demand for wine worldwide and large amounts of wine stock in-tank) had major effects, with uncontracted fruit in many cases unable to be sold and a number of producers making decisions to rest vineyards or remove vines altogether.

This trend of vintages below the long-term average suggests a likely step-change within our industry, whereby we are unlikely to return to the long-term average yield of 1.7 million tonnes in the foreseeable future. This, combined with the structure of our statutory levy system, means significant flow-on effects for levy-funded R&D, marketing and other activities, the effects of which are already being seen within the AWRI.

One positive development for the Australian wine industry in April 2024 was the removal of the punitive tariffs on Australian wine exported to China. This decision was obviously welcomed by exporters, but with some caution, as demand for wine in China has decreased significantly since 2020 and this market is unlikely to be a 'silver bullet' in correcting our supply/demand imbalance.

Actions by peak bodies and governments to address some of the challenges facing our industry included further consultation and revision of the One Grape and Wine Sector Plan by Australian Grape & Wine and Wine Australia, as well as the formation of a working group by Australia's Agriculture Ministers to provide recommendations on how best to support growers in managing the oversupply of red wine. AWRI contributed technical expertise and evidence-based opinions to both of these activities.

Effects of repeated low vintages on R&D funding

At the AWRI in 2023/24, the financial effects of the multiple low vintages continued to affect our underlying budgetary position. R&D levies are linked directly to national tonnage, and thus Wine Australia's R&D budget is also reduced in low-vintage years, with this reduction passed onto R&D providers such as the AWRI. This year was the third year out of the last five that the vintage-related funding reduction clause within the AWRI – Wine Australia Investment Agreement was enacted. Last year's report set out a number of steps that were taken to manage the significant funding reductions in the short term. These included a decision when setting the budget for 2023/24 to 'underwrite' staffing costs by $537K, in order to maintain our scientific and technical capability in the face of what was thought to be a one-in-ten-year low vintage. However, this year, with another low vintage recorded, our budgetary situation reached a tipping point where short-term cost-cutting measures were no longer sufficient and reducing staff numbers was the only option available to bring our budget back towards balance. In late June, AWRI underwent a significant downsizing process, which resulted in ten staff being made redundant, and a further three having their working hours or position changed. This loss of valued and experienced staff was in addition to the 22 staff members not replaced since 2022 through retirements and resignations.

At the end of the 2023/24 financial year, AWRI recorded an operating (P&L) loss of $2.11 million, which was a result of a number of key factors including the underwriting of staffing costs ($537K) explained above, lower than anticipated income from our investment agreement with Wine Australia ($835K) and staff redundancy costs ($484K).

Positive outcomes for industry

Despite these significant headwinds, there continue to be many exciting research, development and extension projects underway at the AWRI. This Annual Report describes how these projects are being conducted in concert with growers and winemakers across Australia, and how they are contributing to positive outcomes for our industry. We encourage you to peruse the highlights pages and delve into the more detailed reports to understand the diverse work that is in progress. From grapevine clonal identification to re-use of fermentation carbon dioxide or recycling of wine lees, there is still an enormous amount to feel proud of in terms of what is going on at the AWRI, which remains the Australian wine industry's own research organisation. The progress we have been able to achieve this year is testament to the dedication and resilience of our team – and we will continue to find ways to conduct the research and provide the support and services that Australian grape and wine producers need.

Sustainable Winegrowing Australia – membership growth and governance review

Membership of Sustainable Winegrowing Australia grew from 1,277 to 1,479 members in 2023/24. Members now represent 51% of Australia's vineyard area and 71% of the national crush. The proportion of members achieving certified status also grew, from 52% in 2022/23 to 60% in 2023/24. This growth reflects the hard work and cooperation over several years of staff from the three organisations that govern the program – AWRI, Wine Australia and Australian Grape & Wine. The leadership, training, communications and support delivered by the Sustainable Winegrowing Australia team are making a real difference to the sustainability of Australian wine and its prospects in the global market. The program is also closely aligned with national and international programs, including the Sustainability Wine Roundtable, an independent global platform dedicated to advancing sustainability in the wine industry.

Five years on from the launch of Sustainable Winegrowing Australia in 2019, it was seen as the right time to review the governance structure of the program to ensure it remains fit for purpose. Directors Australia was engaged to conduct the review and its findings are currently being considered by the program's Joint Steering Committee.

AWRI's own commitment to sustainability continued during the year, with a review of our carbon and water footprint conducted with the help of Tandem Energy, funded by a Green Industries SA grant. This review has established a robust baseline that new initiatives to reduce our footprint can be judged against. More information is available in the Environmental, Social and Governance (ESG) section of this report.

Continued support from Bioplatforms Australia and the Government of SA

Bioplatforms Australia (enabled by the Australian Government's National Collaborative Research Infrastructure Strategy, NCRIS) and the Government of South Australia are key investors into the AWRI through their support of the South Australian node of Metabolomics Australia. In December 2023, these agencies agreed to reinvest in the SA Node of Metabolomics Australia and support ongoing operations and staffing through to 2028 with an investment of $4.118M from Bioplatforms Australia and $2.165M from the SA Government. This reinvestment is a significant acknowledgment of the work done by our metabolomics team over the past five-year investment period, providing cutting-edge expertise and infrastructure to researchers and practitioners across a wide range of sectors. Most importantly, this investment also ensures our ability to support the wine industry during times of emergency response (such as when dealing with smoke taint or other contamination issues) through the availability of the latest instrumentation and technologies.

In March 2024, the SA Government opened calls for expressions of interest in a new round of funding. The AWRI applied for additional funding of $6.51 million for 2024/25 to 2028/29 to enhance research translation. If successful, this funding will support an initiative to bridge the gap between the technologies provided by current 'omics platforms and their industrial application, particularly in the fields of agriculture and environmental monitoring.

Affinity Labs – expanding our network

Affinity Labs has continued to build its network of sample drop-off and pick-up points in Victoria and NSW. We extend our thanks to those businesses partnering with us to help provide faster and better services across the Yarra Valley, Hunter Valley, Geelong and Mornington Peninsula wine regions. A key event during the year was the appointment of a dedicated staff member located in the business's Merbein, Victoria facility in the Murray Valley, to support viticulture, wine and horticulture clients. Over the next year, it is anticipated that services offered out of Merbein will be expanded to include maturity testing, grapevine trunk disease diagnostics and virus diagnostic testing for other crops.

Affinity Labs' partnership with Campden BRI in the UK also strengthened this year, with support provided for the development of a co-branded laboratory based in Guildford for the UK wine industry, which is expected to open early in the next financial year. This forms part of the exchange of methods and knowledge between the two organisations, with AWRI benefiting from Campden BRI's expertise in food and beverage production and analysis. This partnership is allowing us to adopt new methods quickly and continue to expand the services we offer to Australian customers. The new laboratory in the UK will also support Australian wineries exporting to the UK with end-to-end quality assurance and quality control testing services.

Supporting professional development

Supporting our staff to continue learning and developing throughout their careers is a key ongoing priority. Our internal leadership development program continued during the year, with two new staff joining the program in February after two had completed their two-year participation. In addition, staff accessed a range of other professional development opportunities including training in management, communication and leadership, as well as participation in national and international scientific and technical conferences.

Changes to AWRI Board

There were a number of changes to the AWRI Board this year. In October 2023, long-standing Director Liz Riley's term came to an end after a stellar 12-year contribution to the AWRI Board. We wish Liz well in her next endeavours and know she will continue to work hard for the success of our industry. At the start of November, two new appointed Directors joined the Board – Carolyn MacDonald, Chief Operating Officer at the Walter and Eliza Hall Institute of Medical Research and Trish Barry, CEO of Mastermind Consulting. Their skills in operations, business development, marketing and communications have been a very valuable addition to the Board. In addition, a casual vacancy caused by the resignation of grapegrower representative, Andy Clarke was filled by highly experienced viticulturist and director, Damien Sheehan from Mt Langi Ghiran in Western Victoria. Damien brings important grapegrowing expertise to the group. At the end of December 2023, Nigel Sneyd's term as a Director elected by large levy payers also came to an end. The AWRI Board thanks Liz, Andy and Nigel for their valuable contributions.

Wine Australia projects

In this second year of the current Wine Australia investment agreement, projects continued under the three categories established the previous year – insights, impact and extension and adoption. Insights projects (the more traditionally structured research projects) made good progress, with highlights and details provided later in this report. Extension and adoption projects continued to deliver valued services to industry. Impact projects (co-designed projects, focused

on commercialisation) successfully progressed from the initial scoping and co-design phases to commencement of five projects:

- Generating value from ferment carbon dioxide
- Single-step heat and cold stabilisation
- Smart surfaces for removing unwanted sulfur compounds from wine
- *Brettanomyces* diagnostics
- Smoke rapid test.

End-of-year reviews conducted with Wine Australia and project partners demonstrated positive outcomes across all five projects, supporting their continuation into 2024/25. Industry partners have engaged strongly with these projects, valuing in particular their practical focus on addressing key challenges. Discussions on potential new projects for 2024/25 are also progressing well. AWRI and Wine Australia have worked closely together to refine the processes for design, approval and conduct of impact projects, with notable improvements in efficiency achieved during the year. Continued evolution of these processes will support more streamlined project initiation and management. However, the current structure and resourcing model for impact projects relies heavily on a pipeline of AWRI research outcomes, which is finite. This presents some sustainability challenges that will need to be addressed to ensure the program's long-term viability.

Wine Australia announced significant changes to its philosophy on extension and adoption during the year, following ACIL Allen's Review of Wine Australia. It announced that it would appoint a National Extension Manager and implement a national campaign-based approach to its extension and adoption activities from July 2024. For AWRI, this change will mean a significant reduction to extension funding from July 2024, a move away from practice change activities, which have been a key focus since the previous extension and adoption review, and, most significantly, the removal of funding to deliver roadshow workshops and seminars in Australia's wine regions. We are disappointed not to be able to continue this important function, which ensured regular face-to-face contact for producers with researchers and technical experts in regions across Australia, from Great Southern to the Granite Belt. Within the revised extension and adoption portfolio, the AWRI helpdesk, agrochemicals, library and communications will continue, as well as the specialised behavioural science capability, which has provided valuable insights for the extension program. Looking forward, AWRI will continue to explore complementary funding opportunities to sustain and enhance our extension capabilities.

International partnerships and forums

Participation in the global scientific community is key for AWRI to maintain the quality and relevance of its science and provide the most up-to-date information to Australian producers. This year, the 'BAG' alliance between the University of Bordeaux, AWRI and Geisenheim University was renewed for a further five years and expanded to include the University of Adelaide as a new partner. This alliance has been instrumental in facilitating multi-country research projects, particularly in areas relevant to climate change adaptation, NOLO wine production and sustainability. In addition, a number of international scientists and students were hosted at AWRI this year, sharing their expertise, methods and knowledge with our scientists and boosting our overseas networks. Our membership of international alliances, such as OENOVITI International, continued – helping to support the dissemination of grape and wine science around the globe. In addition, AWRI is involved in international regulatory forums, supporting the Australian Government, Australian Grape & Wine and Wine Australia. Our role in these forums is to ensure a sound evidence base for negotiations of trade barriers, supporting the access of Australian wine into international markets. Activities in this area included participation in meetings of OIV, FIVS and the World Wine Trade Group, with a key focus this year on supporting free trade agreement negotiations with India and working towards stronger cooperation with India on aligning technical requirements for wine.

University of Adelaide

It is an exciting time for our key strategic partner, the University of Adelaide, as it moves towards the merger with University of South Australia to create the new Adelaide University, which will open to new students on 1 January 2026. The Board has received briefings during the year on the progress of the merger, and discussions are underway at several levels as to how AWRI can continue to build on its

existing collaborations as the new university begins. The novation of AWRI's investment agreement with Wine Australia to the University, reported last year, has established a vital supplementary funding mechanism that has helped maintain research capability during a period of constrained levy revenue. This strategic partnership creates opportunities for additional co-investment in industry-aligned projects while ensuring sustainable support for our research. Without the additional funding generated through the novation process, AWRI's capacity to support industry and conduct world-class research would have been substantially more constrained.

Technical trends and key issues from the AWRI helpdesk

Queries received by the AWRI helpdesk continue to provide essential insights into the issues affecting grape and wine producers across Australia. These insights help inform planning of extension and communication activities, as well as our research projects. More detail is provided later in this report on this year's key helpdesk trends, with a brief summary presented here.

Each year viticultural queries tend to relate closely to the weather conditions experienced during the growing season. This year, while conditions were overall less challenging than the previous year, heavy rainfall, flooding, hail, severe winds and heatwaves affected various Australian wine regions at different times. As such, viticulture queries relating to responses to weather events, disease pressure and agrochemical use were relatively frequent. For winemaking, queries on packaging, storage and transport were the most frequent. These included issues related to sulfur dioxide, filtration, bottling advice and the effects of temperature on bulk wine during shipping overseas. Several queries involved difficulties with crossflow filtration of red wines, which can often be due to the build-up of polysaccharides on the filter membranes, sometimes related to *Botrytis* infection of grapes. The next most frequent category of winemaking queries was on smoke taint (see section further down for more details).

Crown gall

A specific viticultural issue that arose during the year was reports of gall-like symptoms on grapevine nursery material and young vines, which raised concerns about crown gall disease. An industry response group was formed to address this issue, with representatives from AWRI, Australian Grape & Wine, Wine Australia, Vine Industry Nursery Association, South Australian Vine Improvement Association, State Government Departments, Vinehealth Australia and diagnostic laboratories. The AWRI helpdesk team played a key role in coordinating meetings of the industry response group, which was tasked with identifying the causal organism(s) and source(s) of infection, as well as establishing best practice management guidelines for infected vineyards. AWRI also produced and distributed a range of communications and resources to keep industry informed during this response, and provided an online form for growers to report symptoms. A Wine Australia-funded project, led by the University of Adelaide, is now progressing investigations of the causal organism(s) and sources of infection.

Smoke taint

Smoke taint continues to be a concern for the wine industry globally, and while we in Australia have been fortunate not to experience major multi-region smoke events since 2020, there were a number of smaller fires in grapegrowing regions during the 2023/24 growing season, where support was provided by the helpdesk and analysis by Affinity Labs. The research team published two papers on earlier smoke research, helping to share the practical outcomes with industry. The first of these provided a summary of recent research from around the world on sources and sensory assessment of smoky attributes in wine, along with opportunities for managing smoky characters. The second highlighted the natural abundance of volatile phenols and phenolic glycosides in oaked commercial wines made from non-smoke affected grapes, allowing for the first time confident analytical identification of smoke effects in wine that has been in contact with oak. Within the Wine Australia impact portfolio, work has progressed on the development of a rapid test for smoke effects in grapes. An additional boost to AWRI's ongoing work on smoke was announced late in the financial year, with Dr Mango Parker awarded a highly competitive Australian Research Council Early Career Fellowship for a project on analysing the airborne volatile compounds in smoke to understand the ones that cause smoke characters in wine. This prestigious fellowship is wonderful national recognition for Mango and for the quality of AWRI's work more broadly on smoke taint and the importance of this research for the wine industry.

Looking towards vintage 2025

Although the start of the 2024/25 growing season has been relatively dry across many of our growing regions, the Bureau of Meteorology is forecasting warmer and wetter conditions for the remainder of the growing season. This may increase concerns about disease pressure and possible flooding, but, depending on where and when the rainfall occurs, could mitigate concerns about water availability that are affecting some regions. AWRI will continue to monitor both the climatic and economic conditions affecting our industry closely, to be able to deliver the most relevant and useful information and support to growers and winemakers.

Thanks to our collaborators, partners and supporters

We would like to thank Australia's grapegrowers and winemakers for their support during the past year. Every interaction a producer has with AWRI, whether it be through contributions to research projects, queries to the helpdesk or participation in events, helps us to stay tuned in to industry needs and to do our jobs better.

We are grateful to Wine Australia for the financial support provided throughout the year and for collaboration across a wide range of areas. We'd also like to acknowledge Australian Grape & Wine for its ongoing support, strong industry leadership and representation of grower and winemaker priorities.

Every year AWRI is involved in a wide range of research collaborations and works closely with clients and investment partners across Australia and around the world. We thank these partners for their ongoing support and for their contributions to the success and sustainability of the Australian grape and wine industry.

The AWRI Board is a dedicated and hardworking group of professionals, working together with the best interests of the organisation at heart. The Directors who served this year are thanked for their commitment and willingness to devote significant time to their AWRI role, and to roll up their sleeves and work through tough decisions. Most importantly, it is AWRI staff who continue to deliver their best efforts for our industry – thank you for your continuing dedication to our mission to support a successful and sustainable Australian wine industry.

Kiaran Kirk
Chair

Mark Krstic
Managing Director

Board members

Prof. K.D. Kirk
BSc (Hons), PhD, DPhil
Chair - Appointed under Clauses 26 and 37.1 of the Constitution
(Appointed Director)

Ms T.R. Barry
(from 1 November 2023)
BBus (Hons), GradCert (Wine Mkt), GAICD
Appointed under Clause 26 of the Constitution
(Appointed Director)

Mr A.J. Clarke
(to 10 August 2023)
BAgSc (Vitic), GAICD
Elected under Clause 27 of the Constitution
(Levy Payer elected Director)

The Hon. S.J. Courtney
BChemEng (Hons), BCom (Fin), MSc (Wine Technol and Vitic), GAICD
Appointed under Clause 26 of the Constitution
(Appointed Director)

Mr W.I. Ellis
BAppMgmt
Appointed under Clause 27 of the Constitution
(Levy Payer elected Director)

Ms P. Giannini
BEc, GradDipAcc, CA
Appointed under Clause 26 of the Constitution
(Appointed Director)

Dr M.P. Krstic
BAgSc (Hons), PhD, MBA, GAICD
Ex officio under Clause 25.5 of the Constitution as
Managing Director

Ms C.J. MacDonald
(from 1 November 2023)
BA (Journalism), GAICD
Appointed under Clause 26 of the Constitution
(Appointed Director)

Mr B.M. McClen
BAgSci (Hons), MBA
Elected under Clause 27 of the Constitution
(Levy Payer elected Director)

Ms E.A. Riley
(to 31 October 2023)
BAppSc (Wine Sci), GAICD
Appointed under Clause 26 of the Constitution
(Appointed Director)

Mr D.J. Sheehan
(from 1 November 2023)
BAppSc (Viticulture)
Appointed under Clause 27.4 of the Constitution
(Levy Payer elected Director)

Mr T.N. Sneyd MW
(to 31 December 2023)
BAppSc (Wine Sci), DipNat (Oenol), MBA, GAICD
Elected under Clause 27 of the Constitution
(Levy Payer elected Director)

Ms C.N. Wright
BCom, BAgSc (Oen)
Elected under Clause 27 of the Constitution
(Levy Payer elected Director)

Board notes

Chair
Prof. K.D. Kirk

Audit Committee
Ms P. Giannini (Chair), Mr B.M. McClen, The Hon S.J. Courtney

Personnel Committee
Prof. K.D. Kirk (Chair), Mr T.N. Sneyd (to 31 December 2023), Mr W.I. Ellis, Ms C.J. MacDonald (from 5 March 2024)

Nominations Committee
Dr J.S. Harvey (Independent Chair), Ms N. Palun (Independent member), Ms E.A. Riley (to 31 October 2023), Ms C.N. Wright

Communications and Marketing Committee
Ms T.R. Barry (Chair), Ms C.J. MacDonald, The Hon S.J. Courtney

Meetings

Ordinary General Meeting
The 69th Ordinary (Annual) General Meeting was held on 5 December 2023.

Board
The Board of the AWRI met on the following dates: 18 and 19 September 2023; 5 December 2023; 6 February 2024; 5 March 2024; 20 May 2024; 18 and 19 June 2024.

Investment

The Board of the AWRI acknowledges the continuing financial support of Wine Australia; the Government of South Australia; Landscape South Australia; the Australian Government Department of Agriculture, Fisheries and Forestry; the Australian Government Department of Industry, Science and Resources; and Bioplatforms Australia, along with a large number of confidential commercial clients. AWRI is committed to investing the funding it receives from Wine Australia in accordance with the performance principles for Research and Development Corporations set out by the Australian Government.

Appreciation

AWRI benefits greatly from collaborations with individuals and organisations from the following countries: Australia, Canada, France, Germany, Indonesia, Italy, South Africa, UK and USA. The assistance and cooperation provided by these partners across the globe are gratefully acknowledged.

Pictured left to right: *Mark Krstic, Corrina Wright, Damien Sheehan, Trish Giannini, Wayne Ellis, Trish Barry, Kiaran Kirk (Chair), Carolyn MacDonald, Brett McClen, Sarah Courtney*

Recycling yeast lees

Winery lees, usually seen as a waste stream, were successfully transformed into a fermentation additive, demonstrating one option for pursuing a circular economy within a winery.

Crown gall industry response

The helpdesk team coordinated the initial national industry response to an outbreak of gall-like symptoms in vineyards, providing technical information and collating reports of symptoms, while collaborating with industry bodies, nurseries and other stakeholders.

Protection against cold instability from red wine pigments

Accelerated ageing experiments with red wines showed that wine pigments retain protective effects against KHT crystallisation, even when they are converted into different forms during ageing.

NOLO product development

Twenty-seven potential new NOLO wine products were developed and packaged by industry clients accessing the NOLO trial-scale facility within WIC Winemaking Services on the Waite Campus.

Highlights of the year

Customers, consumers and markets

Helping Australian producers comply with new regulations

Following the introduction of new rules for wines exported to the EU to include energy and nutritional information on labels, internal research demonstrated that no additional analysis was needed to meet the requirements, saving costs and speeding up time to market for Australian wine. This work was communicated to producers via a series of webinars and seminars, in conjunction with Wine Australia.

Supporting wine trade with India

AWRI participated in the third in a series of trade delegations to India with Wine Australia, Australian Grape & Wine and the Australian Government Department of Agriculture, Forestry and Fisheries. The focus of the delegation was to meet with a range of technical and training institutes within India and investigate opportunities for collaboration on grape and wine production.

Assistance with vineyard resting

AWRI staff worked with chemical suppliers and PIRSA/SARDI scientists on the best way to use ethephon in vineyards for bunch removal. The APVMA permit was amended to allow a higher rate of ethephon to be used once in the season, rather than two applications at a lower rate. Advice was provided to growers considering this method of vineyard resting, with tips for most effective application, including timing, coverage and temperature.

Registration of new agrochemicals

The agrochemicals team worked with chemical companies on the registration of three new active constituents (BLAD, fenpropidin and indaziflam) for use in wine-grape production. Because the compounds had not previously been used in Australia in circumstances where the active ingredients would contact grapevines, data on fermentation impacts, sensory effects and residues were required to assess their suitability.

Extension, adoption and education

New monitoring and evaluation framework

AWRI's behavioural scientist has developed a new monitoring and evaluation framework for assessing extension and practice change activities. The framework assesses changes in knowledge and behaviour at different time points, with follow-up evaluations helping to understand both barriers and drivers of change, influencing future activities. This framework has also now been successfully trialled outside the wine sector, after it was presented at an international extension conference.

Engagement with Punjabi growers

The extension team developed a new relationship with the Punjabi-speaking grower community in the Riverland, SA. Resources on irrigation were translated into Punjabi and a tailored workshop was presented, with assistance from a Punjabi translator.

Involvement in One Basin CRC

AWRI is a tier-three partner of One Basin CRC, a Cooperative Research Centre that supports collaborations between researchers and industry on a sustainable future for the Murray-Darling Basin. AWRI's role is to offer behavioural insights into potential projects that might benefit the wine industry. An 18-month project titled 'Incentivising and investing in climate adaptation and the adoption of sustainable basin management practices' is currently underway. This project aims to identify the best approaches for programs on climate adaptation and adoption of sustainable practices by Basin landholders.

Response to crown gall

A number of producers reported gall-like symptoms on grapevines this year, raising concerns about a possible outbreak of crown gall. An industry response group was formed, with representatives from AWRI, Australian Grape & Wine, Wine Australia, Vine Industry Nursery Association, South Australian Vine Improvement Association, State Government Departments, Vinehealth Australia and diagnostic laboratories. AWRI produced and distributed a range of communications materials including a fact sheet, *eBulletins* and an information pack of resources. The team also created an online form for growers to report cases of gall-like symptoms to help assess the extent of this problem across Australia.

Seminars and workshops

One seminar event and six workshops were delivered in 2023/24. The roadshow seminar presented the latest research outcomes across a range of grape and wine science topics, while the workshops covered aeration of ferments, foliar spraying to boost white wine flavour, drought resilience and smoke taint. Wines made by industry partners in regions across NSW, SA and Victoria who trialled foliar spraying in their vineyards were presented in three workshops.

AWRI and Affinity Labs websites

In 2023/24, 201,823 visitors accessed the AWRI website and there were 1,126,823 page-views. Technical updates to content on the AWRI website included information on agrochemicals, wine analysis, pests and diseases, smoke taint, cap management, frost and irrigation. New webpages were created on the foliar spray practice change theme and on crown gall. A total of 15,388 users visited the Affinity Labs website this year and it received 226,628 page views.

Webinars

Sixteen webinars were presented to a total of 1,340 attendees in 2023/24. Webinars covered a wide spectrum of topics across winemaking and viticulture, as well as seasonal technical topics, updates on Sustainable Winegrowing Australia, the National Vintage Report and climate outlooks for the months leading into and throughout vintage. The recordings of this year's webinars uploaded to AWRI's YouTube channel attracted a combined 8,000 views. Topics such as struck flint aroma, greenhouse gas emissions, the use of non-*Saccharomyces* yeast in winemaking and malolactic fermentation were among most popular to be viewed online.

Podcasts

To wrap up the viticulture-focused series two of 'AWRI decanted', two podcast episodes were recorded and released during the year. These episodes focused on the practice change theme of using nitrogen and sulfur foliar sprays in the vineyard to boost white wine flavour. The two podcasts were released in December 2023, with one of the episodes on the science behind the practice and the other discussing a producer's experience in using this technique. All episodes of AWRI decanted are freely available via podcast apps and from the AWRI website.

New Instagram account

An Instagram account for AWRI was launched in September 2023, with the audience growing to more than 1,400 followers by the end of the financial year. Instagram offers an opportunity to connect with stakeholders who may not access other AWRI platforms.

Videos

AWRI's YouTube channel provides access to webinar recordings and other AWRI video content. The channel gained almost 1,000 new subscribers during the year to reach a total of a total of 6,310 by 30 June 2024. There were 227,402 views of videos on the channel and a total watch time of 14,540.6 hours.

Helpdesk support

In 2023/24, the AWRI helpdesk responded to 1,729 winemaking and viticulture enquiries and conducted 154 investigations. After a very high number of viticulture queries last year, numbers returned to close to the ten-year median, perhaps as a result of less extreme weather conditions than 2022/23. While it was not a major year for bushfires nationally, queries about smoke were still elevated, following fires in Victoria and WA. Other topics with high numbers of queries included sulfur dioxide use, filtration, bottling, the effects of temperature on bulk wine during shipping, managing disease, and dealing with a range of climatic conditions.

Library services

AWRI's library services continued to see increased demand, with a 35% increase in the number of requests processed. In early 2024, the library joined a global network of libraries, which allows the contents of 754 university libraries to be made available to our industry without charge.

Education for growers and winemakers

The AWRI delivered three Advanced Wine Assessment Courses, two Advanced Viticulture Courses, one Advanced Wine Technology Course and three GrowStrong Regional Viticulture Fundamentals Courses (for the Wine Grape Council of SA) during the year. These courses help growers and winemakers maintain and update their skills, supporting an innovative wine sector. Future Advanced Viticulture Courses are expected to expand into new areas outside SA.

Horticultural apps

Continuing to build on expertise developed in AWRI's agrochemicals project, two new agrochemical apps were delivered for producers of apples/pears and stone fruit. Similar to the 'Dog book' for grapegrowers, these apps help horticultural producers comply with agrochemical residue requirements in their own industry. AWRI is now supporting six horticultural associations with management of agrochemical residues.

ShowRunner

Fifty shows totalling approximately 17,500 entries used the ShowRunner platform in 2023/24. This year also saw the launch of phase 1 of the benchmarking, evaluation and data analysis portal. This addition allows organisers to send results at the click of a button, gives exhibitors access to instant feedback from shows, and allows judges to access reports from events they have judged in.

Performance, products and processes

New technique for studying mouthfeel effects

A technique known as 'soft tribology', which measures friction, was used to investigate the effect of tannin, proline and fructose on human saliva and to link this with sensory analysis of wine mouthfeel. Friction measurements were decreased by proline and increased by tannin, aligning with sensory studies that showed increases in perceived viscosity in wines with added proline and increased astringency in wines with added tannin. Consumers were found to prefer high-proline wines with a more viscous texture.

Factors that promote 'flint' and 'struck match' flavours

AWRI researchers published research on 'flint'/'struck match'/'mineral' aroma, highlighting the importance of 2-furylmethanethiol (2FMT) and phenylmethanethiol (PMT) in 'struck flint' aroma in Chardonnay wines. Recent laboratory-scale fermentations confirmed that lower grape must pH values promoted PMT formation, while the presence of metal ions decreased PMT concentrations in finished wines.

Prototyping a kit for preventative *Brettanomyces* detection

Development of a winery-deployable detection kit for detecting *Brettanomyces* in wine has progressed significantly, including successful manufacturing of the kits by project partners. The next step is for these prototypes to be trialled in wineries.

Continuing to publish smoke taint research

Two new papers on smoke taint research were published this year. One summarises recent research on sources and sensory assessment of smoky attributes in wine and provides an outlook on opportunities for managing excessive smoky characters. The other highlights the natural abundance of volatile phenols and phenolic glycosides in oaked commercial wines made from non-smoke affected grapes, enabling confident identification of smoke-affected wine even when it has been in contact with oak.

Progress towards rapid smoke test

To ensure a robust path to market for a rapid test for smoke-affected grapes, evidence has been gathered about the market, supply chain and financial modelling, with the value proposition for an MIR-based test validated against competing approaches. Market insights have confirmed that the wine sector continues to see value in a diagnostic test for smoke-affected grapes that reduces turnaround times for results.

Red wine's protection against cold instability maintained during ageing

Recent AWRI research showed that monomeric anthocyanin provided protection against KHT crystallisation in red wines. Accelerated ageing experiments were conducted to see if changes to pigment composition over time might decrease this protective effect. While accelerated ageing did decrease cold stability and this effect was stronger in low-anthocyanin wines, the absolute changes in cold instability were minor. It was concluded that wine pigments retain some protective capacity against KHT crystallisation even when no longer in the monomeric form.

Analytical capability expanded

AWRI's nanoparticle tracking analysis capability has been enhanced by adding fluorescence detection, increasing the ability to study molecular interactions in wine.

Application of CRISPR technology to wine yeast

CRISPR technology represents a significant advancement in genome editing, which can result in microorganisms that meet the requirements to be classified as non-genetically modified. AWRI researchers have now established a CRISPR-based workflow for commercial wine yeast. This workflow enables engineering, and subsequent combining, of multiple desirable traits into a single 'trait-stacked' yeast strain.

Exploring the market for single-step stabilisation

Work is underway to better understand the market for natural zeolite as a new stabilisation product that can address both heat and cold stabilisation and to build business models for the use of alternative stabilisation products in the future.

Next steps for smart surfaces

While the technical performance of smart surfaces that remove unwanted volatile sulfur compounds from wine has been demonstrated, there is work to be done to understand the market for this technology. There is potential for this type of surface to be integrated into a range of wine-related applications; however, there are cost barriers and market needs to be addressed before this technology can reach its full potential. In related work, another type of nano-engineered surface was shown to effectively adsorb histamine and tyramine from model wine, potentially offering a new solution for controlling biogenic amines, which can currently only be removed from wine using bentonite.

Propagation method for malolactic bacteria

A method for the propagation of malolactic bacteria was demonstrated at laboratory scale using non-*Saccharomyces* yeast to stimulate bacterial biomass accumulation to exceptionally high levels. This propagation method has promise as a tool for use in commercial wineries.

NOLO CRC-P projects underway

The CRC-P project on NOLO wines, led by Australian Vintage Ltd, commenced during the year, following formalisation of research agreements with industry partners. AWRI is delivering two of the pillars of this project, focused on improving mouthfeel and flavour of NOLO wines.

Environment, sustainability and natural capital

Continued growth in Sustainable Winegrowing Australia membership and certification

Membership of Sustainable Winegrowing Australia continued to grow, reaching 1,479 members in 2023/24, increasing from 1,227 in the previous year. Members are located in 55 wine regions and represent 51% of Australia's vineyard area and 71% of the national crush. The proportion of members achieving certified status also grew from 52% in 2022/23 to 60% in 2023/24. Almost one-third (32%) of Australia's wine-grape vineyard area now has certified member status.

Adoption of Sustainable Winegrowing Australia trust mark on wine bottles

Accompanying the growth in certification, adoption of the Sustainable Winegrowing Australia trust mark has also increased, with more than 700 wine labels bearing the mark and the equivalent of 96.1 million bottles of wine qualifying for trust mark use.

Understanding the national picture of sustainable wine production

The AWRI sustainability team provided nationally aggregated data and worked with Wine Australia to deliver the third annual Sustainable Winegrowing Australia Impact Report, which focused on member performance improvements since 2020. Highlights included almost five times more members prioritising energy efficiency and a similar increase in members taking action to reduce waste diverted to landfill.

Recycling yeast lees into fermentation nutrients

Winery lees, usually seen as a waste stream, were successfully transformed into a fermentation additive, highlighting an opportunity to reduce waste and contribute to achieving a circular economy within a winery. Addition of the processed lees was shown to reduce fermentation times in Chardonnay ferments.

Generating value from ferment CO_2

Investigation of the potential to create value from the carbon dioxide generated in wineries during fermentation is underway. This work is evaluating different options for capture and re-use of fermentation carbon dioxide, including assessment of their economic performance and solving technical challenges that are specific to wineries. This process could become increasingly important, as commercial supplies of CO_2 are often a by-product of industries linked to fossil fuels, and availability may drop as the economy decarbonises.

Key genetic dataset of Australian grapevine germplasm

A whole-genome dataset for more than 1,100 grapevine samples across 35 varieties has now been collated, representing the majority of commercial wine-grape clonal material available in Australia. By comparing genetic relatedness of samples using unique DNA fingerprints, cultivar-specific family trees have been produced that enable the clustering of samples into robust clonal genetic groups. This foundational dataset will now be used as a basis to investigate the practicality of providing a genetic test for grapevine clonal identity, through a Wine Australia-funded impact project.

Conclusion of citizen science project

Over its three-year lifespan, AWRI's citizen science project, 'Yeast Catchers' worked with more than 3,300 school students from across Australia to isolate yeasts from the environment. More than 6,000 individual yeast isolates obtained from over 750 positive samples were assessed to determine their species using DNA-based microbial profiling techniques. In total, 113 different yeast species were identified.

Possible fining alternatives to PVPP

Preliminary research indicates that graphene and carbon nanotubes could be effective alternatives to PVPP, potentially supporting efforts to discontinue use of single-use plastics in wine production.

Foundational data and support services

Affinity Labs

A total of 19,823 samples were submitted to Affinity Labs for routine, trace and microbiological analysis. This was a decrease compared with the previous year, reflecting the lower than average 2024 Australian harvest and the generally difficult market conditions for Australian grape and wine producers. Customer numbers grew by 144 during the year, a slightly higher increase than the year before, with the majority of these from the wine and grape sector.

Expanding regional network

Affinity Labs launched a new facility in Merbein, Victoria, to support viticulture and horticulture clients with reliable testing and diagnostic services. Regular sample pick-up services are now set up in the Hunter Valley and Yarra Valley, partnering with local businesses. These are augmented by *ad hoc* pick-up services with regional partners in Geelong and Mornington Peninsula.

Co-branded laboratory in UK

A new Campden BRI-Affinity Labs laboratory is being established in Surrey Technology Park, UK, with significant input from Affinity Labs. This forms part of the exchange of methods and knowledge between the two organisations, with AWRI benefiting from Campden's expertise in food production and analysis. The new laboratory will also provide important quality assurance services to Australian wine producers exporting wine to the UK.

New testing options for industry

Grapevine variety testing was made commercially available to industry by Affinity Labs, through a partnership with CSIRO. The test involves DNA typing using a single nucleotide polymorphism (SNP) panel made up of 48 SNP markers. This is then compared to the CSIRO grapevine variety SNP database, allowing the variety to be identified.

AWRI marketing

The 'It's your AWRI' campaign was launched on 1 December 2023 across various social and digital platforms. The campaign's main objective was to educate stakeholders about AWRI's role within the Australian wine industry and increase awareness of the services offered. Since the launch of the campaign, 16,500 people have been reached on social media with a further 5,000 reached through other digital channels.

Successful grant applications

A new agreement was signed with Bioplatforms Australia, supported by the Government of South Australia, to support the Metabolomics SA facility at AWRI over five years. Other successful grant applications included partnerships in the ARC Centre of Excellence for Mathematical Analysis of Cellular Systems, an ARC Linkage Infrastructure, Equipment and Facilities grant for ion mobility-mass spectrometry, the ARC Training Centre in Plant Biosecurity, and the awarding of an ARC Early-Career Industry Fellowship to Dr Mango Parker to further her research on smoke taint.

Use of NOLO trial-scale facility

Eleven commercial clients have accessed the new NOLO facility, benefiting from the subsidy provided by the Government of South Australia. From these clients, 27 potential new products have been packaged as part of new product development activities.

Metabolomics services and support

Metabolomics SA provided 'walk-up' access to mass spectrometry and nuclear magnetic resonance technology for more than 2,500 analyses. The facility also provided training to seven PhD students and three professional scientists in metabolomics sample handling and preparation, instrument operations and data analysis.

Staff

The number of AWRI staff employed in a full-time, part-time and casual capacity as at 30 June 2024 was 135 (100.4 full-time equivalents). When the number of AWRI-based students (both from Australia and overseas) and visiting researchers is added, the total increases to 142. Of these, approximately 44% (last year 55.2%) were funded by Wine Australia in 2023/2024.

Office of the Managing Director

Mark Krstic, BAgSc (Hons), PhD *UniTas*, MBA *MelbBusSchool*, GAICD, Managing Director

Shiralee Dodd, BA, LLB (Hons), GradDip (Legal Prac) *UniAdel*, Company Secretary

Ella Robinson, BA, BSc (Hons) *UniAdel*, Communication Manager

Tony Robinson, BSc (Hons) (Hort and Vitic) *UniWA* and *UniAdel*, PhD *Murdoch*, General Manager – Business Development

Natalie Burgan, Cert IV (Bus Admin) *National Group Training*, Dip (Proj Mgt) *SG Learning and Development*, Executive Officer/ AWITC Conference Manager

Kate Hardy, BA, LLB (Hons), GradDip (Legal Prac) *UniAdel*, GAICD, Legal Advisor

Kyla Schmidt, Dip (Wine Mktg) *UniAdel*, Marketing Manager

Cerys Colquhoun, BCA (Vis Effects and Ent Design) *Flinders*, Design and Communication Coordinator/Communications Officer (AWITC)

Corporate Services

Peter Nguyen, LLB (Hons), GradDip (Legal Prac), BComm *Flinders*, CA, GAICD, General Manager – Corporate Services

Angus Forgan, BSc (Hons) *Flinders*, Operations and Research Laboratory Manager

Adam Holland, Cert IV (IT) *NTUni*, IT Manager (to 9 February 2024)

Alfons Cuijvers, MLaw *UniAntwerp*, Human Resources Manager

Catherine Borneman, BBus (Acc) *RMIT*, CA, Accountant

Fang Tang, Undergrad (Foreign Econ) *RenminUniChina*, GradDip (Fin Mgt), MCom *UniNewEng*, CPA, Finance Officer

Pauline Jorgensen, Cert III (Bus Admin) *TAFE SA*, Finance Officer

Kylee Watson, Cert III (Fin Services) *TAFE SA*, Finance Officer

Alex Hennig, Cert IV IT (Networking) *TAFE SA*, Microsoft Office Associate, IT Support Officer (to 15 September 2023)

Josephine Giorgio-Ion, BUrbRegPlan (Hons) *UniSA*, Receptionist

Jennifer O'Mahony, Receptionist

Research

Markus Herderich, staatlich geprüfter Lebensmittelchemiker (CertFoodChem), PhD *UniWürzburg*, GAICD, Director of Research

Keren Bindon, BSc (Hons) (Biol) *UniNatal*, MSc (Plant Biotechnol) *Stellenbosch*, PhD (Vitic) *UniAdel*, Research Manager

Anthony Borneman, BSc (Hons), PhD *UniMelb*, Research Manager – Molecular Biology

Simon Schmidt, BSc (Hons), PhD *Flinders*, Research Manager – Biosciences

Leigh Francis, BSc (Hons) *Monash*, PhD *UniAdel*, Honorary Fellow

Yoji Hayasaka, DipEng (Ind Chem) *Tokyo IT*, MPharm *Victorian College of Pharmacy Monash*, PhD *Yamanashi*, Honorary Fellow

Paul Henschke, BSc (Hons), PhD *UniAdel*, Emeritus Fellow

Marlize Bekker, BSc (Ind Chem), BSc (Hons), MSc (Chem), PhD (Chem) *Stellenbosch*, Principal Research Scientist (to 11 August 2023)

Cristian Varela, BSc (Biochem), MSc (Biochem), PhD (Chem Eng and Bioprocesses) *CatholicUniChile*, Principal Research Scientist (to 4 August 2023)

Agnieszka Mierczynska-Vasilev, MSc (Chem), PhD *UniLodz*, Principal Research Scientist

Josh Hixson, BTech, BSc (Hons) *Flinders*, PhD *UniAdel*, Senior Research Scientist

Mango Parker, BSc (Chem) *Flinders*, PhD *UniSA*, Senior Research Scientist

Tracey Siebert, ScTechCert (Chem) *SAIT*, BSc (Org Chem and Pharmacol) *UniAdel*, PhD *UniSA*, Senior Research Scientist

Wes Pearson, BSc (Wine Biochem) *UniBritishColumbia*, GradCert (Appl Sensory Sci and Consumer Testing) *UC Davis*, PhD *CSU*, Senior Research Scientist

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Toni Garcia Cordente, BSc (Chem), BSc (Biochem), PhD (Biochem and Mol Biol) *UniBarcelona*, Research Scientist

Peter Costello, BSc (Hons), MSc *UniNSW*, PhD *UniAdel*, Research Scientist

Darek Kutyna, MSc *AgUniPoland*, PhD *Victoria*, Research Scientist

Cristobal Onetto, MSc, PhD *UniAdel*, Research Scientist

Chris Ward, BSc (Hons) (Genet and Evol), PhD *UniAdel*, Research Scientist

Deanna Langone, BSc (Hons) (Foren and Analyt Sci), PhD *Flinders*, Post Doctoral Research Fellow

Sheridan Barter, BTech (Foren and Analyt Chem), BSc (Hons) *Flinders*, Senior Scientist

Damian Espinase Nandorfy, BSc (Hons) (Oen and Vitic) *BrockUni*, GradCert (Appl Sensory and Consumer Sci) *UC Davis*, Senior Scientist (to 28 June 2024)

Stella Kassara, BSc (Hons) *UniAdel*, Senior Scientist

Mark Solomon, BSc (Hons) (Med Chem) *Flinders*, Senior Scientist

Eleanor Bilogrevic, BSc (Nutr and Food Sci) *UniSA*, GradCert (Appl Sensory and Consumer Sci) *UC Davis*, Scientist

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Desireé Likos, BSc (Biochem and Microbiol) *UniAdel*, GradCert (Appl Sensory and Consumer Sci) *UC Davis*, Scientist

Lisa Pisaniello, BSc (Foren and Analyt Sci) *Flinders*, Scientist

Tim Reilly, BSc (Hons) (Nanotech) *Flinders*, Scientist

Steven Van Den Heuvel, BSc (Hons) (Molec Biol) *Flinders*, Scientist

Alex Schulkin, BSc *Bar-Ilan*, GradDip (Oen) *UniAdel*, Scientist

Kate Cuijvers, BSc (Hons) (Genet) *UniAdel*, Cert II (Medical Service First Response) *StJohn*, Technical Officer (to 28 July 2023)

Laura Hale, BSc (Genet), BSc (Hons) (Evol and Paleobiol) *UniAdel*, Technical Officer

Jane McCarthy, Cert (Anim Hand), Cert (Vet Nurs) *TAFE SA*, AdvCert (Med Lab Sci) *UniSA*, Technical Officer

Joe Rossi, BSc (Hons), PhD *UniAdel*, Technical Officer

Song Qi, BSc (Molec and Drug Design) *UniAdel*, Technical Officer

Jelena Jovanovic, Purchasing Officer

June Robinson, Laboratory Assistant

Metabolomics South Australia

Natoiya Lloyd, BSc (Hons) *Flinders*, PhD *UniAdel*, Manager Metabolomics SA

Luca Nicolotti, M (Chem and Pharmaceut Technol), PhD *UniTurin*, Senior Research Scientist

Vilma Hysenaj, BSc, M (Pharm Chem), PhD (Food Chem) *UniGenova*, Research Scientist

Maryam Taraji, BSc (Appl Chem) *UniGuilan*, MSc (Analyt Chem) *Al-Zahra*, PhD *UniTas*, Research Scientist

Don Teng, PostGradDip (Math and Stat), MSc (Bioinform) *UniMelb*, Lead Data Engineer

Flynn Watson, BSc (Hons) (Double Chem) *UniAdel*, Senior Scientist

WenWen Jiang, BBioeng *DalianPolytech*, MOenVitic *UniAdel*, Scientist

Danielle Carter, DipHRM *TAFE SA*, Cert IV (Pers Inj Mnt), Lean Six Sigma Yellow Belt (Advanced) *UniAdel*, Quality Assurance and Technical Officer

Georgia Davidson, BSc (Hons) (Foren and Analyt Chem) *Flinders*, Technical Officer

Sensory panel

Nina Blake, Junko Blaney, Amy Cantor, Allison Cox, Amanda Dalton-Winks, Sara Davis, Penelope Elliot, David Evans, Penelope Fox, Philippa Hall, Sonya Henderson, Mary-Jane Hendry, Mary Likos, Beverley Kiil, Rosemary McCarron, Kerin Montgomerie, Virginia Phillips, Pierre Rafini, Jane Schapel, Makiko Sheehy, Corey Spencer, Jacqueline Stone, Volker Trede, Susan Zabrowarny

Industry Development and Support

Mardi Longbottom, BAgSc (Vitic Sci), MVit, PhD *UniAdel*, General Manager – Industry Development and Support

Con Simos, BAppSc (Oen) *UniAdel*, MBA *UniSA*, Group Manager – Industry Development and Support (to 8 November 2023)

Peter Dry, BAgSc, MAgSc, PhD *UniAdel*, Emeritus Fellow

Linda Bevin, BBus (Info Mgt), GradDip (Lib and Info Stud) *QUT*, Information and Knowledge Manager

Valeria Bellan, BPsychSc, MClinPsych *UniPavia*, PhD (Cog Neurosc and Exp Psych) *UniMilanoBicocca*, Behavioural Scientist/Psychologist

Adrian Coulter, BSc *Flinders*, GradDip (Oen) *UniAdel*, Senior Oenologist

Geoff Cowey, BSc (Hons) *UniAdel*, BAppSc (Wine Sci) *CSU*, Dip *WSET* (Certified Educator), Cert IV (Training and Assessment) *Malyon*, Senior Oenologist

Matt Holdstock, BSc *Flinders*, GradDip (Oen) *UniAdel*, Senior Oenologist

Robyn Dixon, BSc, GradDip (Vitic) *UniAdel*, MAppSc *Lincoln*, Senior Viticulturist (to 19 April 2024)

Marcel Essling, BBus *Victoria*, BAgSc *UniAdel*, Senior Viticulturist

Liz Pitcher, BAgSc (Hons) *UniAdel*, BAppSc (Vitic) *CSU*, Cert IV (Training and Assessment) *Harrison Training Group*, Sustainability and Viticulture Specialist

Ben Cordingley, BSc (Hons) (Biotechnol) *UniNSW*, BWineSc *CSU*, Oenologist

John Gledhill, BAppSc (Wine Sci), BAppSc (Vitic) *CSU*, Winemaker

Rochelle Schlank, BSc (Chem), BSc (Hons) (Wine Sci), PhD (Vitic) *UniAdel*, Viticulturist (from 23 October 2023)

Francesca Blefari, BBus *UniEdithCowan*, Project Manager (to 15 September 2023)

Jessica Scudds, BCA (Fashion Design and Tech) *Flinders*, Project Manager

Anne Lord, GradDip (Info Stud) *UniSA*, Librarian

Rosanne Dunne, BA (Info Stud) (Public and Corp Info Mgt) *UniSA*, AALIA, Library Coordinator

Russell Desmond, BViticOen *UniAdel*, Operational Winemaker

Will McSorley, DipEventMgt *TAFE SA*, Project/Conference Coordinator

Maria Calabrese, Event Coordinator (to 17 November 2023)

Charlene Rosales, Event Coordinator (from 8 January 2024)

Affinity Labs

Eric Wilkes, BSc (Hons) (Chem), PhD *UniNewcastle*, General Manager – Affinity Labs

Neil Scrimgeour, BSc (Hons) (App Chem) *Wolverhampton*, Business Development Manager

Regina Baaijens, M (Hons) (Agric Syst and Mgt) *Massey*, M (Plant Path and Molec Biol) *UniPhilippines*, PhD *Lincoln*, Manager Applied Biosciences (from 4 September 2023)

Leanne Hoxey, BSc *UniAdel*, Manager Operational Support

Nuredin Habili, BAgSc (Hons), PhD *UniAdel*, Emeritus Fellow

Simon Nordestgaard, BEc, BE (Hons) (Chem), PhD *UniAdel*, Principal Engineer

Bryan Newell, BAppSc (Chem and Physics) *UniSA*, Team Leader – Analytical Laboratory

Pamela Solomon, BTech (Foren and Analyt Chem), BInnovationEnterprise (Sci and Tech) *Flinders*, Trace Laboratory Manager

Susanne Copeland, MBiochemEng *MannheimUniApplSci*, Quality Assurance Coordinator

Kieran Hirlam, BE (Hons) (Chem), BFin *UniAdel*, Project Team Manager

Marco Schoeman, BSc (Biotechnol) *UniAdel*, Customer Service Manager

Wen-Hsiang (Denny) Hsieh, BChemEng *TatungUni*, MChemMatEng *NationalCentralUniTaiwan*, MViticOen *UniAdel*, Project Engineer (to 2 November 2023)

Caroline Bartel, BSc (Hons) (Biotech) *UniAdel*, Scientist

Karloskar Hall, BE (Civil and Environ) *UniAdel*, Applications Support Officer (from 13 November 2023)

Thomas Hensel, BTech (Foren and Analyt Chem), BSc (Hons), MSc (Chem) *Flinders*, Method Development Chemist

Simone Madaras, BSc (Hons) (Foren and Analyt Chem), PhD *Flinders*, Project Scientist

Jesse Hall, BSc (Foren and Analyt Sci) *Flinders*, Senior Laboratory Technician

Ida Batiancila, Laboratory Technician

Zung Do, BFoodSc, MFoodSc *HanoiUniSciTechnol*, PhD *UniAdel*, Laboratory Technician

Liam Lepore, BSc (Foren and Analyt Sci), BSc (Hons), *Flinders*, Laboratory Technician (from 17 June 2024)

Orlando Holzapfel, BSc (Analyt Chem) *CSU*, Laboratory Technician (from 3 June 2024)

Joshua Lennon, BSc (Chem and Comp Sci) *Uni Adel*, Laboratory Technician

Jacinta McAskill, Cert III (Lab Operations) *Sunraysia TAFE*, Laboratory Technician

Emily Milsom, BSc (Hons) (Chem) *UniAdel*, Laboratory Technician (to 28 June 2024)

Emma Muehlberg, BTech (Foren and Analyt Chem), BSc (Hons), PhD *Flinders*, Laboratory Technician (to 3 May 2024)

Jessica Schrapel, BSc (Hons) (Foren and Analyt Sci) *Flinders*, Laboratory Technician

Dean Smiley, Laboratory Technician

Heather Tosen, BSc *UniAdel*, Laboratory Technician

Matthew Wheal, BSc (Hons) (Biol), PhD *UniAdel*, Laboratory Technician

Qi Wu, BPlantProtection *SouthChinaAgric*, MPlantHealthBiosecurity, PhD *UniAdel*, Laboratory Technician

Xiaojun (Sara) Zhan, BViticOen *UniAdel*, Laboratory Technician

Rachel West, BTech (Foren and Analyt Chem), BSc (Hons) (Foren and Analyt Chem), PhD *Flinders*, Operational Support Technician

Yihe (Eva) Sui, MViticOen, PhD *UniAdel*, Project Technician

Ching Yee (Hebe) Wong, BNutrFoodSci *UniSA*, Food and Beverage Technician (from 22 January 2024)

Farimah Arshadi, BAgSc *IslamicAzadUniShiraz*, MSc (Plant Path) *UniPutraMalaysia*, Technical Services Representative (from 12 February 2024)

Robyn Gleeson, Customer Service Officer

Jillian Lee, Customer Service Officer

Will Walker, BSc (Org Chem and Physiology) *UniAdel*, Customer Service Officer (from 11 July 2023)

Gina Sellars, Laboratory Assistant

Susan Lincoln, Courier

Students

Bryce Polley, *QUT*, PhD student

Staff activities

Reggie Baaijens is a member of the Editorial Board for the journal *Plant Pathology* (Wiley), an Adjunct Research Fellow at Charles Sturt University, a member of the Australasian Plant Pathology Society and a member of the National Plant Biosecurity Diagnostic Network.

Keren Bindon is an Associate Editor of the *Australian Journal of Grape and Wine Research*.

Anthony Borneman is an Affiliate Associate Professor at the University of Adelaide.

Natalie Burgan is a member of the planning committee for the Australian Wine Industry Technical Conference.

Cerys Colquhoun is Executive Officer for the Wine Innovation Cluster Leadership and Research Committees and a member of the planning committee for Crush – the grape and wine science symposium.

Ben Cordingley is a committee member for the Interwinery Analysis Group.

Adrian Coulter is an Affiliate Lecturer at the University of Adelaide.

Robyn Dixon is a member of Barossa Vine Improvement Committee; Riverland Grape and Wine Technology Group; and Biodiversity McLaren Vale Group.

Peter Dry is an Adjunct Associate Professor at the University of Adelaide and Associate Editor of the *Wine & Viticulture Journal*.

Rosanne Dunne is a member of the Australian Library and Information Association's Government and Special Libraries Sector Committee, and a member of the Australian Scholarly Communications Community of Practice.

Angus Forgan is a member of the South Australian Institutional Biosafety Committee Network Forum and a member of the SA Biobank Technical Reference Group.

Leigh Francis was an Associate Editor of the *Australian Journal of Grape and Wine Research* (to 14 March 2024) and an Affiliate Associate Professor at the University of Adelaide (to 28 January 2024).

Kate Hardy is a member of the Advisory Board for the University of Adelaide Law School; Secretary for the University of Adelaide Wine Alumni Network; and a member of the Board of the International Wine Law Association Australasian Section. She was a Director of the McLaren Vale Grape Wine & Tourism Association Board until February 2024.

Paul Henschke is an Affiliate Professor at the University of Adelaide and Fellow of the Australian Society of Viticulture and Oenology.

Markus Herderich is an Affiliate Professor at the University of Adelaide; and member of the Metabolomics Australia Executive Management Group. He is also 2nd Vice President of the Organisation Internationale de la Vigne et du Vin (OIV), Chair of OIV's Sub-commission on Method of Analysis and an expert in Commission-II (Oenology); a member of the Wine Industry Technical Advisory Committee; a member of the Wine Innovation Cluster Research Group; and an Associate Editor of *OENO One*.

Kieran Hirlam is a member of Australian Grape & Wine's Packaging Committee; a member of the Independent Brewers Association Sustainability Group; a member of the Australian Distillers Association Safety and Sustainability Committee; and was a member on the PACKWINE Editorial and Content Committee (ECC).

Mark Krstic is an Adjunct Professor at Macquarie University; Chair of the Australian Wine Industry Technical Conference; Director of the National Wine Foundation; member of Hort Innovation's Table Grape Strategic Investment Advisory Panel; member of the Waite Strategic Leadership Group; member of the OENOVITI and BAG International Executive Committee; member of Joint Steering Committee for Sustainable Winegrowing Australia; member of Australian Grape & Wine's Sustainability Advisory Committee; Associate Editor of *Wine & Viticulture Journal*; Honorary Senior Fellow at the University of Melbourne; and a graduate of the Australian Wine Industry Future Leaders Program.

Natoiya Lloyd is a member of the Metabolomics Australia Executive Management Group; member of the Metabolomics Australia Analytical group; and serves as the South Australian representative for the Australian and New Zealand Metabolomics Society.

Mardi Longbottom is a member of Australian Grape & Wine's Sustainability Advisory Committee; member of the Environmental Technical Committee of Freshcare Ltd; and Fellow of the Governor's Leadership Foundation Program.

Agnieszka Mierczynska-Vasilev is an Affiliate Associate Professor at Flinders University and a member of the Australian Near Infrared Spectroscopy Group.

Peter Nguyen is a Director, Treasurer and Public Officer of the Australian Wine Industry Technical Conference.

Simon Nordestgaard is Conference Manager for the Winery Engineering Association.

Cristobal Onetto is an Affiliate Senior Lecturer at the University of Adelaide.

Wes Pearson is a Director of McLaren Vale Grape Wine and Tourism Association; a committee member of the McLaren Vale Districts Group; a graduate of the Australian Wine Industry Future Leaders Program and an alumnus of the Len Evans Tutorial.

Ella Robinson is a member of the Australian Wine Industry Technical Conference Communications and Marketing sub-committee.

Tony Robinson is a Non-Executive Director of the Australian Wine Industry Technical Conference; an *ex officio* Councillor of the Royal Agricultural and Horticultural Society of South Australia and Deputy Chair of the Wine Show Sectional Committee; an alumnus of the Australian-American Fulbright Program; a graduate of the Australian Wine Industry Future Leaders Program; and an MBA Candidate and Aspiring Leaders Scholarship recipient at the University of Adelaide Business School.

Kyla Schmidt is a National Science Week SA coordinating committee member; member of the Australian Wine Industry Technical Conference planning committee; and Chair of the Australian Wine Industry Technical Conference Communications and Marketing sub-committee.

Simon Schmidt is an Affiliate Associate Professor at the University of Adelaide and manager of the Australasian Yeast Group website.

Neil Scrimgeour is a member of the Independent Brewers Association Quality & Technical Group; a member of the Australian Distillers Association Technical Standards Project Group; and a member of the Innovation and New Product Development, Food Microbiology and Sensory and Consumer Science Special Interest Groups with the Australian Institute of Food Science and Technology.

Con Simos is a member of the WA Wine Industry Association R&D Committee and a graduate of the Australian Wine Industry Future Leaders Program.

Fang Tang is Secretariat for the Interwinery Analysis Group.

Cristian Varela is a member of the Editorial Board of the journals *Applied and Environmental Microbiology, International Journal of Food Microbiology* and *FEMS Yeast Research*. He is also an Affiliate Senior Lecturer at the University of Adelaide and member of the Australian Society of Viticulture and Oenology.

Rachel West is Samples Coordinator for the Interwinery Analysis Group.

Matthew Wheal is the Secretary and South Australian representative of the Australasian Plant and Soil Analysis Council.

Eric Wilkes is a member of the expert panel of the Sub-commission on Method of Analysis in OIV's Commission-II (Oenology); a member of the Wine Industry Technical Advisory Committee; co-chair of the FIVS (International Federation of Wines and Spirits) Scientific and Technical Committee and Codex Task Force; Chair of the FIVS working group on fire impacts; an industry representative for the World Wine Trade Group and a member of the Wine Industry Suppliers Association management committee.

Project reports

Customers, consumers and markets

The Australian wine industry depends on producing wines that consumers value, trust and are able to access in both domestic and international markets. Projects under this theme aim to provide technical guidance on agrochemical use to meet export market requirements; to preserve the integrity and quality of Australian wine; and to contribute technical expertise to national and international forums on wine regulation.

Staff

Marcel Essling, Thomas Hensel, Prof. Markus Herderich, Anne Lord, Dr Eric Wilkes.

Collaborators

Agrochemical manufacturers, suppliers and consultants; Agrochemicals Reference Group; Australian Grape & Wine (AGW) (Damien Griffante, Anna Hooper, Lee McLean); Australian Pesticides and Veterinary Medicines Authority (APVMA) (James Deller); CropLife Australia (Jana Phan, Gregory Sekulic); Department of Agriculture, Fisheries and Forestry (DAFF) (Amie Brumfield, Sean Macintyre, Thomas McKernan, Timothy Ruben); E. & J. Gallo Winery, USA (Steve Tallman); ETS Laboratories, USA (Gordon Burns); FIVS (Julie Hesketh, Charles Jefferson, Ignacio Sanchez); Food Standards Australia New Zealand (FSANZ) (Dr Mark FitzRoy); GrapeLink (Graeme Forsythe); Grapeweb (Okhi Oktanio); Homologa (Olivier Flandre); Organisation International de la Vigne et du Vin (OIV), France (Dr John Baker, Neslihan Ivit, Dr Jean-Claude Ruf); South Australian Research and Development Institute (SARDI) (Dr Ismail Ismail, Dr Mark Sosnowski); Pernod Ricard Winemakers (Philip Deverell); Treasury Wine Estates (Dr Marcos Bonada); Wine Australia (Steve Guy, Ned Hewitson, Rachel Triggs, Naomi Verdonk); Wine Institute, USA (Jamie Ferman); University of Lisbon (Prof. Sofia Catarino, Vasilik Thanasi); University of Bordeaux, France (Guillaume Leleu, Prof. Tristan Richard).

Supporting market access, safety and regulation

Background

With more than 600 million litres of wine exported each year, the Australian wine industry needs to facilitate sensible regulation of wine composition, production, labelling and marketing, all of which can affect access to export markets. Managing and reducing current and potential barriers to trade are also important for maintaining market access and opening new markets for Australian wine. This project provides industry stakeholders with timely and accurate technical information to support policy positions. It also supports representation at national and international industry forums to facilitate informed discussions and balanced approaches for issues relevant to the Australian wine industry.

Making it easier to meet market regulations

Tools and information were developed and communicated to Australian producers to reduce the impact of the new EU regulation on energy, nutritional and ingredient labelling for wine. Dr Eric Wilkes presented a range of seminars and webinars, in conjunction with Wine Australia, based on internal research that demonstrated an approach to nutritional and energy labelling that required no additional testing other than that already required for export certification. This approach will save producers significant potential costs and reduce delays in getting product to market.

The project team participated in international meetings held by organisations including the OIV, FIVS and the World Wine Trade Group. This included Dr Markus Herderich acting as 2nd Vice-President of the OIV and chairing the Subcommission of Analytical Methods, and Dr Eric Wilkes chairing the FIVS Scientific and Technical Committee. Support was also provided to AGW's Wine Industry Technical Advisory Committee, with information delivered on changes to the international regulatory environment and opportunities to improve market access. Topics discussed included: definitions of genetically modified organisms by the Office of the Gene Technology Regulator and the ongoing review of 'Definitions for gene technology and new breeding techniques' by Food Standards Australia New Zealand.

OIV – the driver of international wine standards

During the year, recommendations were made on 47 draft resolutions under preparation by OIV's Commission-II (Oenology). The project team also participated in electronic working groups seeking to:

- harmonise production standards for de-alcoholised wine
- clarify the role of oenotannins as additives and processing aids in response to changes to EU nutrient and ingredient labelling rules
- establish specifications for 'natural' L-tartaric acid.

Feedback was provided on OIV's draft new strategic plan for 2025 to 2029, with many of the suggestions made by the project team incorporated into the plan. Once this plan is adopted, OIV's activities are expected to focus on the following six scientific and technical priorities:

- Coordinate approaches to sustainability
- Promote resilient and sustainable viticulture
- Adapt oenology and production processes to the future
- Support all vitivinicultural products
- Simplify international trade
- Contribute to consumer safety and inform perspectives on vine, wine and society.

Driving consistency in international markets

Dr Eric Wilkes participated in the third of a series of trade delegations with Wine Australia, AGW and DAFF to India. The delegation met with technical and training institutes in India to investigate possibilities for collaboration on grape and wine production. It also met with government representatives of both state and federal bodies to consider opportunities to improve ease of access to the Indian market for Australian wine. This work led to an agreement to hold an international regulatory forum in Australia in October 2024, as well as another meeting of the India-Australia governmental joint dialogue group and its associated working groups on regulatory and technical exchange.

World Wine Trade Group (WWTG) meetings during the year continued to discuss improving consistency in definitions of sustainability among participating nations and trying to influence those used in the international marketplace for wine. A working group, chaired by Australia and New Zealand, agreed to carry out a survey of the sustainability platforms within member states to be presented at the upcoming WWTG meeting in Adelaide in October 2024. The WWTG also continued to monitor international technical barriers to trade, providing a robust database of emerging issues and a forum to develop common responses.

The FIVS working group on smoke impacts, chaired by Dr Eric Wilkes, maintained its focus on the relative effectiveness of different testing methods for smoke markers. In conjunction with AGW and South African Wines, the third of three proficiency testing programs was initiated. More than 20 laboratories across the globe will test a range of wines spiked with smoke marker compounds. The results from this study will be presented to participants in the second half of 2024 and at the October FIVS meeting. With the agreement of participants, the results of the three rounds of testing will be combined into a single publication, which will outline the current methods for testing for smoke markers in grapes and wine and the typical variations between laboratories and methods.

Another very active group within FIVS is the Codex taskforce. This group participates in meetings organised by Codex, the international body responsible for food standards, in areas likely to have an impact on wine production and distribution. A recent achievement for this group was a significant expansion of the additives allowed for wine under Codex. This change has included a range of additives that are permitted in the majority of wine-producing countries, helping to ensure that technical trade barriers are not encountered in emerging markets, which often default to Codex standards when they do not have their own wine-specific regulations.

Collecting and disseminating information on agrochemicals

Background

Governments around the world monitor residues of agrochemicals and set limits for the amounts that are legally allowed in foods and beverages. Up-to-date information on agrochemical management is needed to ensure that finished wines meet these limits and do not encounter trade barriers. This project aims to assist grape and wine producers to manage agrochemical residues in their products. This is achieved by collating and providing information on regulatory and technical aspects of chemicals registered for use in Australian viticulture and the maximum residue limits (MRLs) for those chemicals in domestic and key export markets.

The project collects data on the agrochemicals registered for use and procures data from spray diary providers and other sources. This data is useful in identifying trends in chemical use and monitoring the status of the pest and disease issues faced in Australian viticulture. Identifying ways to use and share the data with external bodies using FAIR principles is recognised as being a potential benefit to the broader industry.

Providing information and working for the sector

The project team reviewed the latest information on agrochemicals by liaising with regulators, chemical manufacturers, suppliers and end-users. Best-practice recommendations were then incorporated into a new version of the publication *Agrochemicals registered for use in Australian viticulture* (commonly known as the 'Dog book'), prepared for publication early in 2024/25. Updates were also made to the online search portal and the agrochemical app, and an electronic version of the 'Dog book' was made available through the AWRI website.

Three new active constituents (BLAD, fenpropidin and indaziflam) were registered for use in wine-grape production. Because these compounds had not previously been used in viticulture in Australia in circumstances where the active ingredients would contact grapevines, data on fermentation impacts, sensory effects and residues were required to assess their suitability for use in wine-grape production. Decisions about withholding periods to be included in the 'Dog book' were made by the Agrochemicals Reference Group.

Information on agrochemicals or pest and disease issues was provided to stakeholders via five *eBulletins*, including one in October 2023, which discussed the use of the plant growth regulator ethephon under APVMA permit 92913 for bunch removal. This permit was amended after project staff worked with chemical suppliers and PIRSA scientists to allow a higher rate of ethephon to be used once in the season, rather than two applications at a lower rate.

Responding to weather conditions

A combination of weather factors resulted in extensive rainfall and hail in some regions across the Christmas and New Year period. These types of conditions reliably result in high disease pressure, prompting action from project staff. An *eBulletin* warning about disease pressure and providing information about control measures was distributed in January 2024.

Extension, adoption and education

The full value of research and development is only realised when outcomes are effectively and efficiently implemented by practitioners. For this to occur, both extension and support for adoption or practice change are required. Projects under this theme apply a range of proven mechanisms to communicate research outcomes, solve industry problems, provide access to relevant technical resources, educate and train students, foster industry adoption and bridge gaps between research and practice.

Staff

Dr Valeria Bellan, Linda Bevin, Francesca Blefari (to 15 September 2023), Maria Calabrese (to 17 November 2023), Cerys Colquhoun, Ben Cordingley, Adrian Coulter, Geoff Cowey, Robyn Dixon (to 19 April 2024), Rosanne Dunne, Marcel Essling, Thomas Hensel, Prof. Markus Herderich, Matt Holdstock, Dr Mardi Longbottom, Anne Lord, Dr Simon Nordestgaard, William McSorley, Ella Robinson, Charlene Rosales (from 8 January 2024), Jessica Scudds, Con Simos (to 8 November 2023), Dr Eric Wilkes.

Collaborators

Agriculture Victoria (Dr Sze Flett, Jeremy Giddings); Apple and Pear Australia Ltd (Ian Cover); Australian Mango Industry Association (Marine Empson); Australian Table Grapes Association Inc. (ATGA) (Jeff Scott); Avocado Australia (Flora Zhang); Barossa Grape & Wine Association (Ashleigh Fox); Berries Australia (Jen Rowling); Bureau of Meteorology (Rachel Davis, Dr Jannatun Nahar); Chalmers Wines (Bruce Chalmers, Kim Chalmers); Rae Clark; Charles Sturt University (Prof. Geoff Gurr, Dr Nicholas Pawsey, Prof. Leigh Schmidtke, Dr Nicola Thomas); Flinders University (Prof. Tim Cavagnaro); Foundation Viticulture (Nick Dry); Barbara Hall; James Anthony Consulting (Zachary Bailey, Martin Ruiz); Limestone Ridge Vineyard (Brian Caddy); M. Hill Consulting (Megan Hill); Mount Langi Ghiran (Elizabeth Ladhams, Damien Sheehan); Murray Valley Winegrowers (Paul Derrico, Stuart Putland); National Centre for Timber Durability and Design Life (Pene Mitchell); Netafim (Peter Henry); Pendu Australia (Mintu Brar); Pernod Ricard Winemakers, New Zealand (David Allen); Queensland Wine Industry Association (Andrew Harrigan); Punjabi Akhbar (Simi Gill); Riverland Wine (Charles Matheson); RMCG (Anne-Maree Boland); South Australian Research and Development Institute (SARDI) (Assoc. Prof. Paul Petrie); South Australian Wine Industry Association (SAWIA) (Mark Gishen); See Saw Wines (Justin Jarrett); Sherwood Estates (Brett Proud); Summerfruit Australia (Guy Rischmueller); Sustaining Endeavour (Uma Preston); state and regional wine industry associations; Tamburlaine Organic Wines (Martin Gransden, Andrew Higgins); The Australian Melon Association (Joanna Embry); Thoughtful Viticulture Ltd (Dr Mark Krasnow); Treasury Wine Estates (Catherine Kidman, Angela Pomery); Dr Michael Treeby; University of Adelaide (Dr Thomas Lines, Joseph Marks, Prof. Kerry Wilkinson); University of Sydney (Petr Matous); Vitibit Pty Ltd (Liz Riley); WBM (Anthony Madigan); Western Murray Land Improvement Group (Roger Knight); Wine Australia (Hannah Bentley, Drea Hall, Jo Hargreaves, Dr Sharon Harvey, Sandy Hathaway, Alex Sas, Jacquie van Santen); Wine Communicators of Australia (WCA) (Prue Kline); Wine Network Consulting (Samantha Scarratt); Wine Victoria (Stephanie Duboudin, Richard Howden, Damien Sheehan); Wines of Western Australia (Larry Jorgensen); Winetitles (Sonya Logan, Hans Mick, Meg Riley).

Improving viticulture and oenology practice through extension, communication and education

Background

To maintain their reputation for innovation and ensure sustainable, efficient and competitive practices, it is critical for Australian grape and wine producers to have up-to-date technical information and support. AWRI uses a range of platforms to facilitate early awareness of research findings, adoption of new technologies and practice change, all of which contribute to improvements in sustainability and competitiveness. The team liaises with stakeholders to identify and implement opportunities for practice change and co-designs targeted extension and adoption plans. It also develops new content to support both awareness-raising and practice change objectives, and delivers information via a diverse range of platforms, events and programs. The three practice change priorities currently in focus are:

- improving irrigation efficiency in warm inland regions
- the use of oxygen (aeration) during fermentation
- increasing tropical fruit flavour in white wine through the use of vineyard foliar sprays.

In addition, a range of educational activities including tasting workshops and advanced technical courses are delivered to help build and support the capacity of Australian grapegrowers and winemakers.

Seminars and workshops

A variety of face-to-face events were delivered in 2023/24 (see Appendix 2 for details). One roadshow seminar was delivered in the Barossa Valley in July 2023, with presenters covering a range of grape and wine science topics selected by the regional association. Workshops delivered during the year provided practical, hands-on activities relating to both winemaking and viticulture. One workshop on drought resilience was delivered to grapegrowers and winemakers in the Granite Belt region, with both theoretical and practical components, including hands-on demonstrations in the vineyard of irrigation monitoring and maintenance. A Q&A session on smoke taint was also delivered to the Granite Belt grape and wine community. A workshop on irrigation was presented to the Punjabi-speaking community in the Riverland, SA (see section below for more details). Three workshops aligned with the practice change themes of aeration during fermentation and foliar sprays to boost wine flavour were delivered in Orange, Canberra and the Limestone Coast. These included tastings of wines made as part of case studies of foliar spraying under different conditions. Three workshops on smoke taint were delivered in the Adelaide Hills, Canberra and Yarra Valley, in conjunction with researchers from the University of Adelaide and Charles Sturt University.

Practice change priorities

During the year a range of extension activities were delivered related to the three practice change themes. There was also an increased focus on evaluating the practice change activities delivered.

Improving irrigation efficiency in warm inland regions

Industry needs and priorities related to irrigation were re-assessed following a thorough project evaluation, which noted a change in interest in irrigation from the time the practice change priority was first identified. This change in interest was attributable to increased rainfall and even flooding experienced in inland regions. A new relationship was established with the expanding Punjabi-speaking community of grapegrowers in Australia. A selection of resources on irrigation management and monitoring were translated into Punjabi, and a workshop on irrigation was delivered for the Punjabi community. The engagement with the Punjabi community was positive and the workshop was well attended. Participants reported increased knowledge about best-practice irrigation in Australian vineyards and high levels of satisfaction with the event. In particular the availability of resources translated into Punjabi and the presence of an interpreter at the event were highly valued.

Use of aeration during fermentation

As the final stage of work on aeration of ferments, three workshops were delivered in the lead-up to vintage 2024. Previous evaluations identified that stakeholders wanted more information on available equipment and engineering solutions for retrofitting existing equipment, with cost and lack of knowledge about modifying equipment emerging as barriers to practice change. As such, the workshops delivered this year were designed to focus on these aspects.

Workshop participants represented a range of age groups and came from both big and small vineyards and wineries. The majority of attendees were satisfied or very satisfied with the event they attended and found it useful or very useful and reported increased knowledge of the subject after attending the workshops. Most of the participants declared themselves likely to modify their previous practice following what they learned during the workshop. They also planned to reassess their practices, seek more information, and/or discuss the topic with their peers, with many planning to change at least one of their practices. When contacted after vintage in follow-up evaluations, participants reported a change in awareness or way of thinking about oxygen addition. All attendees felt that the workshop was a good use of levy funds, with 50% being extremely satisfied. The most frequent suggestion for workshop improvement was a request for more practical activities and more opportunities for interaction with the presenters and other attendees.

Foliar sprays to increase flavour potential

Content on the use of foliar sprays to increase flavour potential in white grapes was developed and delivered throughout the year. Case studies were produced across four regions in partnership with growers who had attended one of the earlier extension events on foliar spraying and were interested to trial the practice in their vineyards. Once the vineyard trials were completed and wines made from the trials, the four case studies were presented in a workshop delivered in the Limestone Coast, Orange and Canberra District. Workshop attendees took away with them information on how to apply sulfur and nitrogen as a foliar spray to boost thiol production in white wines. Each workshop included wines made from the four case studies, which allowed the attendees to taste the results of the practice, from four different regions. In one workshop, the grower and winemaker from one of the case studies attended and provided further valuable input into the discussions.

To measure outcomes from the workshops, assessments were made at different time points. At the beginning of each workshop, the participants' baseline intention to change foliar spray practices was measured and at the end of the workshop the effect of the workshop on intention to change practices was assessed. Outcomes indicated that after attending the workshop, attendees came away with a 32% increase in knowledge of the benefits of foliar sprays to boost flavour. Future plans were assessed, with 30% of attendees indicating that they intended to change at least one of their practices and 45% of attendees indicating they would at least re-assess their current practices.

Webinars

Sixteen webinars were presented to a total of 1,340 attendees in 2023/24. Webinars covered a wide spectrum of topics across winemaking and viticulture, as well as seasonal technical topics, updates on Sustainable Winegrowing Australia, the National Vintage Report and climate outlooks for the months leading into and throughout vintage. The portfolio of presenters was diverse, with 60% of the sessions presented by non-AWRI staff. The most popular webinar during the year (with 157 attendees), titled 'Soil health, carbon and undervine management in a dry climate', was presented by Dr Thomas Lines and Joseph Marks (University of Adelaide), Prof. Tim Cavagnaro (Flinders University) and Dr Mardi Longbottom. Each webinar is recorded and uploaded to the AWRI YouTube channel post-presentation, and in the past year, the 16 videos have attracted a combined 8,000 views.

A new approach to measuring the increase in attendees' knowledge on the webinar topics was trialled in 9 of the 16 webinars during the year. Attendees were asked to score their initial knowledge on the webinar topic (out of 10) at the beginning of the webinar and then again after the webinar had concluded. An average of 27% of attendees responded to both questions, and on average their knowledge had increased by about 2 points, which was interpreted

as a good result. Further refinements to the webinar program are in progress. AWRI also provided technical support and hosting of the Wine Communicators of Australia (WCA) webinar program and continued to enhance and support the WCA website throughout the year. This support of the WCA program comes to an end at 30 June 2024.

Podcasts

Two additional episodes were added to series two of the 'AWRI decanted' podcast during the year, completing the series on vineyard practices. These episodes focused on the viticultural practice change theme of using foliar sprays of nitrogen and sulfur in the vineyard to boost white wine flavour. The two podcasts were released in December 2023, with one on the science behind the practice and the other discussing a producer's experience in using this technique. All episodes of AWRI decanted are freely available via podcast apps and from the AWRI website.

Regional resources

A set of regional climate and viticulture management plans were developed for Bendigo, Macedon Ranges, Yarra Valley and Geelong. Two additional case studies were developed in the Murray Darling region, outlining the impacts of undervine cover crops in vineyards.

Educational courses and events

AWRI delivered three Advanced Wine Assessment Courses, two Advanced Viticulture Courses, three GrowStrong Regional Viticulture Fundamentals Courses (for the Wine Grape Council of SA) and one Advanced Wine Technology Course during the year.

AWRI and Affinity Labs websites

The AWRI website is an important platform for communicating with a wide range of stakeholders. During the year, 201,823 visitors accessed the AWRI website and there were 1,126,823 page-views. A total of 15,388 users visited the Affinity Labs website and it received 226,628 page-views. Technical updates to content on the AWRI website included information on agrochemicals, wine analysis, pests and diseases, smoke taint, cap management, frost and irrigation, as well as a range of new 'Ask the AWRI' and *Technical Review* articles. New webpages were created on the foliar spray practice change theme and on crown gall. The website was also used to communicate with subscribers about AWRI Board vacancies and elections, recently published research articles, and events including seminars, workshops, podcasts, tastings and webinars.

eBulletins

Eighteen *eBulletins* were delivered to approximately 3,140 subscribers during the year, providing information on technical issues, agrochemical updates and the release of issues of *Technical Review* (Table 1). This platform, combined with the AWRI website and topical information packs, ensures relevant technical information can be quickly communicated to industry in response to incidents such as adverse weather events or pest and disease outbreaks.

Table 1. *eBulletins* issued during 2023/24

Date	Topic
30 Aug 2023	*Technical Review* August 2023 issue available online
28 Sep 2023	Nominations open for three Director elections and three new appointments announced
5 Oct 2023	Agrochemical update – permit for ethephon products
10 Oct 2023	El Niño declaration prompts planning for possible bushfires and smoke in 2023/24 season
17 Oct 2023	Reminder to nominate for Director elections
26 Oct 2023	AWRI Board election
3 Nov 2023	Preparing for frosts and managing frost-affected vines
14 Nov 2023	AWRI Board election – voting closing soon
28 Nov 2023	2023 AWRI Board election result
29 Nov 2023	*Technical Review* November 2023 issue available online
13 Dec 2023	Christmas closure
11 Jan 2024	A wet season update – managing fungal diseases between veraison and harvest
22 Feb 2024	Crown gall-like symptoms in Australian vineyards
28 Feb 2024	*Technical Review* February 2024 issue available
19 Mar 2024	Update on crown gall-like symptoms
19 Mar 2024	Statement re extension and adoption
12 Jun 2024	Agrochemical update June 2024
21 Jun 2024	Managing dry winter conditions in Australian vineyards

Social media and video content

AWRI's Twitter/X audience declined slightly during the year to just below 4,000 followers, which is not surprising given that overall use of that platform is decreasing significantly worldwide. AWRI's Facebook presence continued to grow, reaching ~2,820 followers. For the first time, an Instagram account for AWRI was launched in September 2023, with the audience growing to more than 1,400 followers by the end of the financial year. Instagram offers the opportunity to connect with stakeholders who may not use other social media platforms or access other AWRI channels.

AWRI's YouTube channel provides access to webinar recordings and other AWRI video content. The channel gained almost 1,000 new subscribers during the year to reach a total of a total of 6,310 by 30 June 2024. There were 227,402 views of videos on the channel and a total watch time of 14,540.6 hours. Sixteen webinar recordings were uploaded to YouTube during the year, with topics including 'struck flint' aroma, greenhouse gas emissions, the use of non-*Saccharomyces* yeast in winemaking, and malolactic fermentation proving the most popular.

Annual report

For the past 69 years, AWRI has produced a printed annual report as its formal report to Australian winemakers and grapegrowers. Since 1999, the annual reports have also been made available on the AWRI website. AWRI publishes a summary of the annual report in the *Australian & New Zealand Grapegrower & Winemaker* and offers to deliver an annual presentation to the board or executive of each major state-based winemaking body. This formal activity complements the wide range of other extension and communication activities undertaken by AWRI staff members throughout the year (see Appendices).

Technical Review

The online *Technical Review* publication includes a selection of recently published grape and wine science literature, curated to ensure relevance to Australian grape and wine producers. From time to time it also features technical articles authored by AWRI staff. Links to full-text versions of open-access articles are provided where available, and industry members can request a copy of non-open access articles from the AWRI library.

Industry articles

For many years AWRI has contributed regular articles to *Wine & Viticulture Journal* and *Australian & New Zealand Grapegrower & Winemaker*, while also contributing to other Australian and international industry journals as opportunities arise. The winter 2024 issue of *Wine & Viticulture Journal* was the last issue of that journal as a standalone publication, although some aspects of it will continue in its sister publication. This may result in some changes to the future calendar of industry articles published by AWRI staff. Details of all articles published during the year are provided in Appendix 7.

Media liaison

AWRI is regularly approached by media organisations in Australia and around the world for comment on technical issues related to wine. Four media releases, one statement and one submission were prepared and distributed, with 23 media interviews conducted during the year (Appendix 6).

Applying behavioural science to support extension, adoption and practice change

Background

The behavioural science capability at AWRI was created to provide guidance, structure and rigorous methodology for the design, evaluation and monitoring of research projects and extension programs, to ensure the greatest possible industry impact. Insights from education, psychology and cognitive neuroscience are applied to ensure continuous improvement in projects and programs.

Supporting practice change

Practice change activities within the extension project were evaluated using an outcome and process evaluation framework, developed in consultation with Wine Australia. The evaluation framework takes into account four concepts (Figure 1). The theory of change underlying this framework suggests that growers and winemakers seek information in response to a perceived need, which may be to solve a problem or to capture an opportunity. The amounts and types of information sought will depend on the level of risk that adoption may entail. The concept of practice change is therefore conceived as a continuum and includes intermediary steps of additional information-seeking, changes in awareness, and trials.

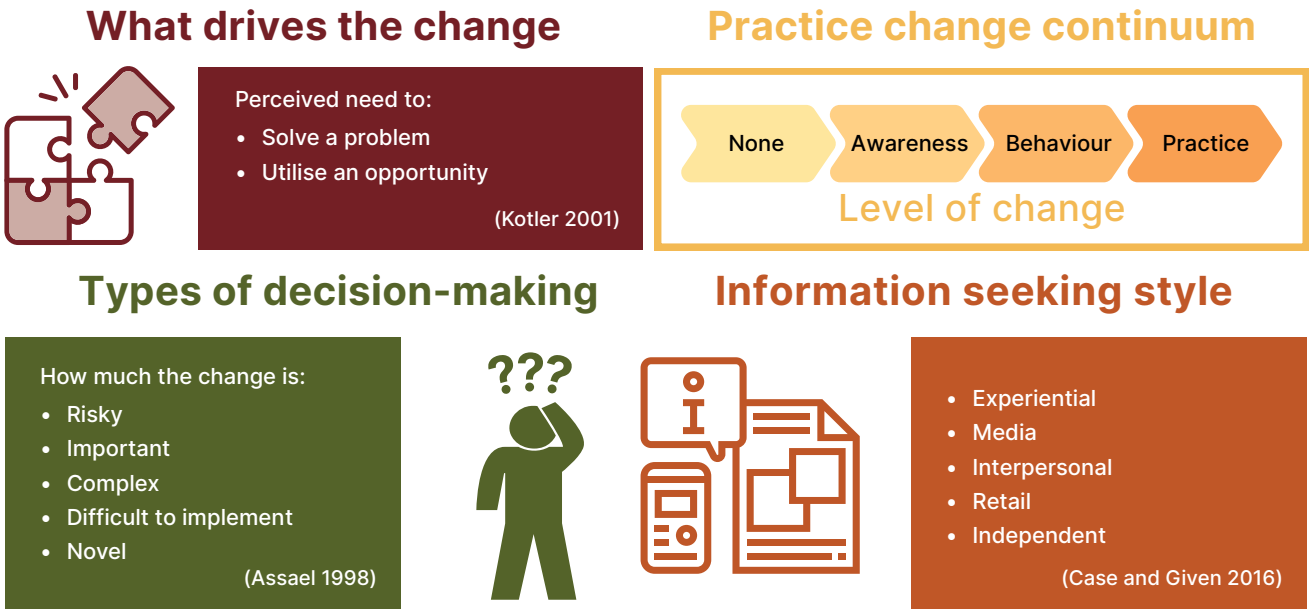

Figure 1. The four key concepts underpinning the evaluation framework: what drives the change; what guides the decision-making process; how people look for information; and the level of change conceived along a continuum

The extension activities assessed included three workshops and a range of online resources. Data were collected through workshop surveys, online surveys, interviews and web analytics. The evaluation confirmed that all three themes were based on solid scientific research, with the extension programs developed by staff experienced in extension and with strong technical and industry knowledge.

One Basin CRC

AWRI is a tier-three partner of One Basin CRC, a Cooperative Research Centre that supports collaborations between researchers and industry on a sustainable future for the Murray-Darling Basin. AWRI's role is to offer behavioural insights into projects that might benefit the wine industry (which is also represented by Wine Australia, a tier-two partner). An 18-month project titled 'Incentivising and investing in climate adaptation and the adoption of sustainable basin management practices' is currently underway. This project aims to identify the best approaches to education and behavioural change for climate adaptation and adoption of sustainable practices by Basin landholders. The research team is focusing on adoption frameworks that are most commonly used, financial incentives and analysis of social networks within different communities of irrigators. An application for a second project titled 'Supporting the engagement and adaptation of advisory businesses and services to digital irrigation futures' is in progress. This project would investigate the information gaps between irrigators and advisers, as well as advisers and agtech companies.

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Development of digital extension tools and software

Background

AWRI provides a range of online databases and mobile apps to support Australian grape and wine and horticultural producers. The uptake of these technologies is high and the demand for technology to improve productivity or promote efficient processes is continuing to increase. This project ensures there is a planned and coordinated approach to the development, delivery and maintenance of innovative and collaborative digital tools.

Mobile apps

The agrochemical and MRL databases form the core capability behind the 'Dog book', agrochemical and MRL online search functions and agrochemical mobile apps. The agrochemical and MRL online search portal attracted 1,405 users during the year. The winemaking calculators app is one of AWRI's most popular tools. It helps winemakers conduct a range of calculations needed during wine production, including for conversions, additions and label requirements. This year, 917 new users downloaded the winemaking calculator app.

Supporting horticultural crops

Two new apps were delivered to apple/pear and stone fruit producers. The MRL digital platforms of regulatory information repositories and mobile apps are now supporting Australian farmers of 15 horticultural crops with a farmgate value of $4.1 billion. This new capability is helping these sectors meet domestic and international regulatory requirements and identify new international market access opportunities.

ShowRunner

Background

ShowRunner, a comprehensive show management software system created at AWRI, encompasses all facets of a wine show, from online entries to electronic scoring and result generation. Initially designed as a custom solution for the Advanced Wine Assessment Course, the software has since evolved to accommodate the specific procedures of the Australian wine show system. Its functionality has also been extended to encompass other uses, such as supporting classification tastings.

Show delivery and new portal

Fifty shows totalling approximately 17,500 entries used the ShowRunner platform in 2023/24. This year also saw the launch of phase 1 of the benchmarking, evaluation and data analysis portal. This addition allows organisers to send results at the click of a button, exhibitors to access instant feedback from shows, and judges to access reports from events they have judged in.

AWRI helpdesk

Background

AWRI's technical helpdesk plays an important role supporting grapegrowers and winemakers across Australia. The helpdesk provides rapid, confidential, technical support on winemaking and viticulture topics, delivered by an experienced, multi-disciplinary team.

Helpdesk enquiries

In 2023/24, 1,729 winemaking and viticulture enquiries were received by AWRI's technical helpdesk (Table 2). Note that while queries related to Sustainable Winegrowing Australia are reported elsewhere in this report, some sustainability-related queries are included in the viticulture tally in Table 2 due to their technical nature. After a high number (886) of viticulture queries last year, this year's number (509) is very close to the ten-year median value (512). In contrast, after a lower than usual number (1,110) of winemaking queries last year, this year's number (1,220) is closer to the ten-year median value (1,265). The lower number of viticulture queries might be the result of less extreme weather conditions compared to 2022/23, which saw the third La Niña event in as many years. The higher number of winemaking queries can be attributed to an increase in smoke-related queries, mainly as a result of bushfires in Western Victoria during February and to a lesser degree fires in southern Western Australia in December and near Perth in January.

The majority of wine and viticulture enquiries were from grape and wine companies and suppliers actively aligned with the wine industry, with a small number coming from government organisations, students, legal practitioners and journalists. Figure 2 shows that the sources of enquiries were broadly in line with the volume of grapes crushed in each state/territory, with proportionally fewer queries from NSW/ACT, which has been the trend over the past three years.

Table 2. Winemaking and viticulture enquiries received by the AWRI helpdesk in 2023/24

Topic	Number of enquiries
Winemaking	1,220
Viticulture	509
Total	**1,729**

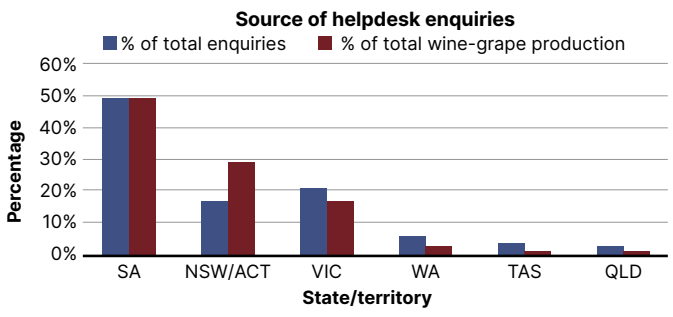

Figure 2. Enquiries received by AWRI helpdesk in 2023/24 by state/territory, compared to wine-grape production in 2024 (Wine Australia National Vintage Report 2024)

Wine and viticulture helpdesk enquiries are classified using 22 subject keywords. The number of enquiries received under each keyword is compared to historical data collected over more than 20 years, to help identify national, state and regional trends. This allows for prompt responses to emerging issues and timely provision of relevant information. Figure 3 shows the wine and viticulture enquiries from 2023/24 arranged in order from most to least used keyword, highlighting key events or issues of interest during the year. For example, the 'Smoke' keyword is ranked fifth in Figure 3, whereas this keyword was ranked thirteenth last year, reflecting the increased number of smoke-related queries resulting from this season's bushfires. As was the case last year, queries assigned to the keyword 'Extension' were the most common this year. These included requests for presentations, events or training.

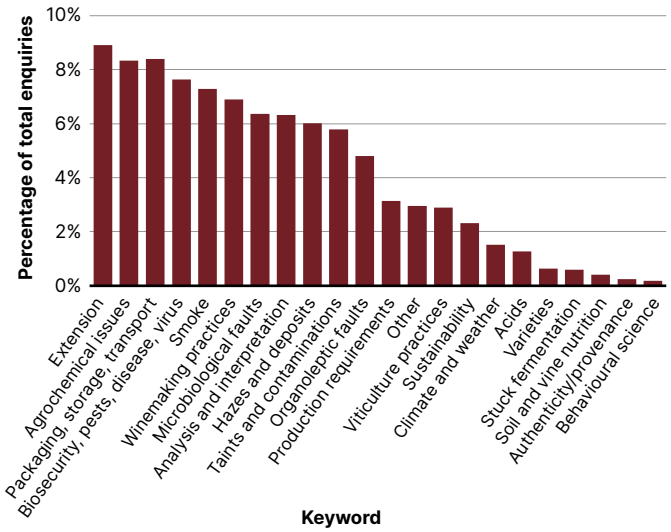

Figure 3. Winemaking and viticulture enquiries received by the AWRI helpdesk in 2023/24, organised by keywords. Enquiry numbers are represented as a percentage of total national wine and viticulture enquiries, where the total number was 1,729.

Viticulture enquiries

During the year, the viticulture team responded to 509 enquiries. Although weather conditions were overall less challenging than last year, heavy rainfall, significant flooding, hail events, severe winds and heatwaves affected various regions at different times. Consequently, some regions experienced disease pressure, leading to queries on agrochemical issues and biosecurity, pests, disease and virus being among the most common this year.

The wine industry faced a number of reports of gall-like symptoms on grapevines, some of which were reported through the helpdesk. As a result, an industry response group was formed, which included representatives from AWRI, AGW, Wine Australia, Vine Industry Nursery Association, South Australian Vine Improvement Association, State Government Departments, Vinehealth Australia and diagnostic laboratories. The AWRI helpdesk team played a key role in coordinating meetings of the industry response group, which was tasked with identifying the causal organism(s) and source(s) of infection, as well as establishing best practice management guidelines for infected vineyards. These goals are being further developed though a new Wine Australia-funded research project. AWRI produced a range of communications materials to keep industry informed during this response, including a fact sheet, *eBulletins*, an information pack of resources and an online form for reporting cases of gall-like symptoms to help assess the extent of this problem across Australia.

Winemaking enquiries

During the year, the winemaking team responded to 1,220 enquiries. Queries relating to packaging, storage and transport represented the largest portion of winemaking queries, as the majority of queries on extension (the most common category this year) were viticulture related. Packaging, storage and transport enquiries were varied and included issues related to sulfur dioxide (SO_2), filtration, bottling advice and the effects of temperature on bulk wine during shipping overseas. Several of the SO_2-related queries were about wines that were not holding free SO_2 prior to bottling or that had lost more free SO_2 than expected after bottling. If not due to excessive exposure to oxygen before or during bottling, such issues are typically due to yeast growth prior to bottling, or yeast contamination during bottling, as yeast produce acetaldehyde, which binds free SO_2, resulting in a decreased concentration. Several queries involved difficulties experienced during crossflow filtration of red wines, which can often be caused by the build-up of polysaccharides on filter membranes. Higher than usual levels of polysaccharides can arise when there has been some degree of *Botrytis* infection, which is notorious for causing filtration problems. In such cases, treatment of the wine with an enzyme that can hydrolyse β-glucan polysaccharides from *Botrytis* can increase wine filterability. In the case of blocked crossflow filter membranes, circulation of a mixed enzyme product with broad spectrum activity can be helpful in removing polysaccharides when typical cleaning agents are not effective.

The second largest number of winemaking enquiries were on smoke, relating to exposure of grapes from bushfires in Victoria and Western Australia. While several enquiries were technical in nature, for example about treatments to remove smoke compounds or differences in the natural background levels of the smoke marker compounds between varieties, most of the queries related to interpretation of smoke marker compound analysis results. Of the requests for results interpretation, approximately 60% were results for grape maturity samples analysed to give producers the information needed to make decisions on whether to harvest fruit. Interpretation of smoke marker analysis results was greatly aided by the publication last year of the results of AWRI research that linked results from grape analysis to the likelihood of perceptible smoke characters in wine (Parker et al. 2023). The results of this research made it easier to understand the risk of producing smoky wine based on the analysis results of grapes, and hence provide more useful interpretations of smoke marker compound results compared to previous years.

Technical problem-solving investigations

This year 14% of enquiries resulted in technical problem-solving investigations, where samples were required for analysis to identify the problem and recommend a solution. The team conducted 154 investigations on 759 samples (Table 3). As with enquiries, use of the problem-solving investigative service was mostly in line with the proportional volume of wine-grape plantings for each state or territory (Figure 4).

Table 3. Investigations conducted and samples analysed by the AWRI helpdesk in 2023/24

Type of investigation	2023/24
Hazes and deposits	42
Microbiological issues	40
Sensory investigations	15
Taints and contaminations	35
Other investigative analyses	20
Viticulture-related investigations	2
Total number of investigations	**154**
Total number of samples analysed	**759**

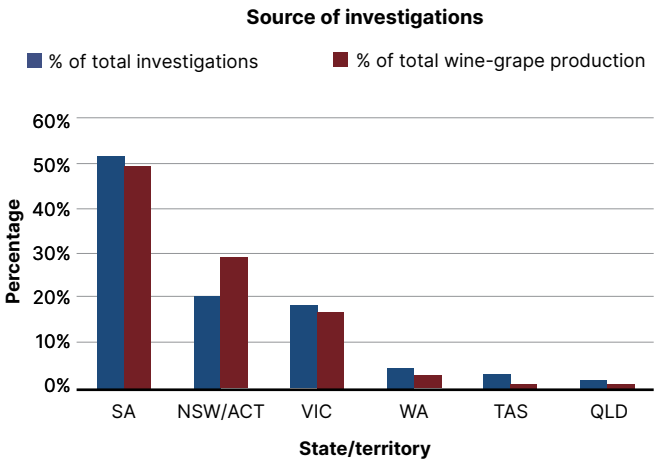

Figure 4. Investigations undertaken by the AWRI helpdesk in 2023/24 by state/territory, compared to wine-grape production in 2024 (Wine Australia National Vintage Report 2024)

Helpdesk investigations are assigned to five main categories: hazes and deposits; sensory investigations; microbiological issues; taints and contaminations; and other (which includes viticulture investigations). While the proportion of investigations in the haze and deposit, taints and contamination and other categories for 2023/24 were relatively consistent with the ten-year averages, microbiological issues and sensory investigations were 12% higher and 11% lower, respectively, than the ten-year averages (Figure 5).

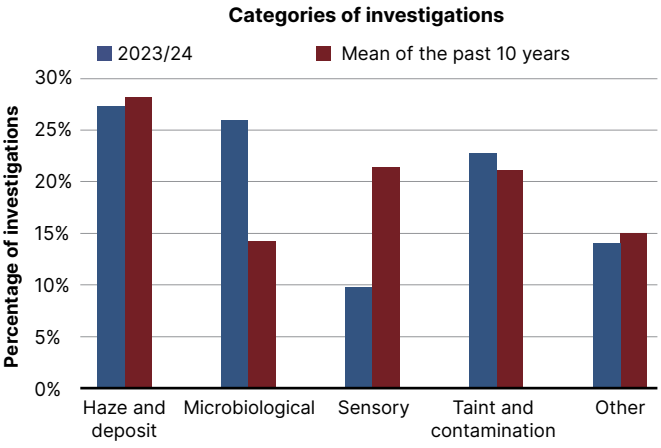

Figure 5. Distribution of helpdesk investigations across five main categories. For 2023/24 the total number of investigations was 154.

Hazes and deposits

The proportion of haze and deposit investigations this year was slightly lower than last year (Figure 6) and also slightly lower than the 10-year average (Figure 5). Crystalline deposits comprised 55% of haze and deposit investigations, with 45% of these identified as calcium L-tartrate, 36% as potassium L-tartrate and 18% as quercetin dihydrate. As was the case for the previous four years, calcium L-tartrate deposits outnumbered potassium bitartrate deposits this year. Calcium L-tartrate crystals form over time post-bottling and are caused by elevated calcium levels rather than ineffective cold stabilisation. Other deposits found in wines included yeast and bacteria, protein and copper-protein hazes, colloidal hazes, rubber O-ring fragments and various fibres.

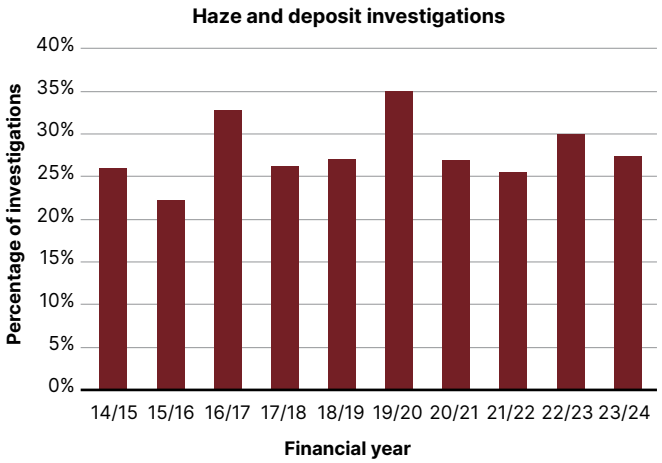

Figure 6. Haze and deposit investigations conducted by the AWRI helpdesk from 2014/15 to 2023/24

Microbiological issues

The proportion of microbiological investigations was 10% higher than last year (Figure 7) and 12% higher than the 10-year average (Figure 5). Spoilage due to *Brettanomyces* accounted for one-third of the investigations, while *Saccharomyces* was found to be responsible for high concentrations of bound sulfur dioxide in several wines. High concentrations of acetic acid were determined to be due to acetic acid bacteria in some cases and lactic acid bacteria in others.

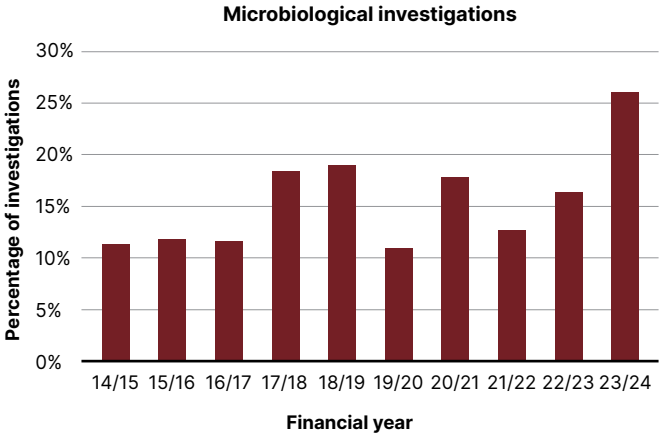

Figure 7. Microbiological investigations conducted by the AWRI helpdesk from 2014/15 to 2023/24

Sensory investigations

The proportion of sensory investigations was 4% lower than last year (Figure 8) and 11% lower than the 10-year average (Figure 5). The investigations conducted included wines affected by oxidation characters, saltiness and in the case of one sparkling wine, indole. An investigation was also conducted into a wine that exhibited a plastic-like character after fermentation in a grape bin covered with a synthetic tarpaulin. The plastic character was found to be due to 2,6-dichlorophenol, which was detected at almost ten times its sensory threshold. It was suspected that the taint originated from the tarpaulin used to cover the grape bin.

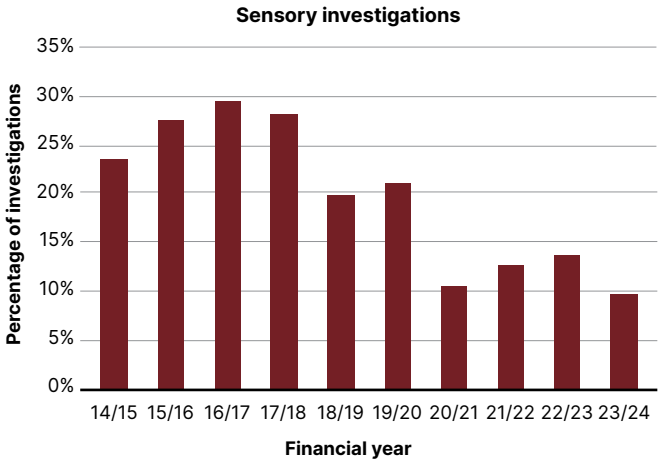

Figure 8. Sensory investigations conducted by the AWRI helpdesk from 2014/15 to 2023/24

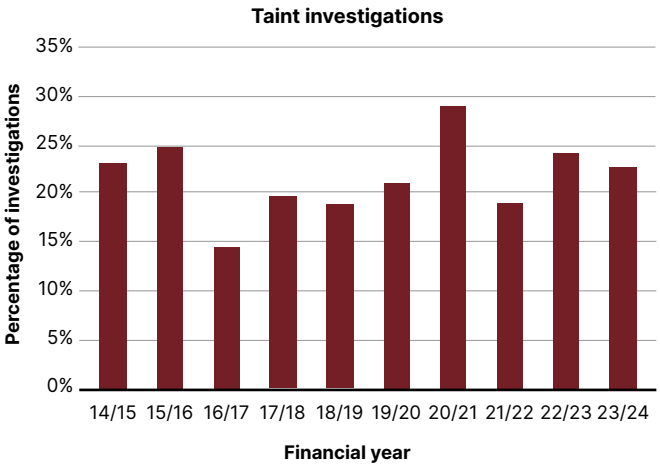

Figure 9. Taint-related investigations conducted by the AWRI helpdesk from 2014/15 to 2023/24

Taints and contaminations

The proportion of taint and contamination investigations was slightly lower (1%) this year than last year (Figure 9), but slightly higher (2%) than the 10-year average (Figure 5). There were 12 investigations into smoke taint in wines, mostly associated with the bushfires in western Victoria, but also with the fire in southern Western Australia. In all these investigations, conclusions about whether the wines were affected by smoke taint were based on the results of sensory assessments, conducted by AWRI's Sensory Scientists according to international standards, using highly experienced judges chosen for their ability to perceive smoke flavour and their previous performance in smoke taint sensory panels. In all such cases, the results of sensory assessments are subjected to statistical analysis, where mean panel ratings for the attributes 'smoke flavour' and 'smoke aroma' are compared to results for 'control' wines known to be free of smoke taint, in order to determine if the 'suspect' wines are rated higher than the 'control' wines for the smoke flavour attributes. For all ten of these investigations, the interpretations of the original grape analysis results provided by helpdesk staff were consistent with the outcomes of the sensory assessments, which were also consistent with the wine smoke panel analysis results.

Other taint and contamination investigations were conducted on wines affected by 'musty' taints, with slightly more being found to be due to tribromoanisole (TBA) than trichloroanisole (TCA). One of the TCA taints was associated with a crossflow filter membrane, where the taint was thought to originate from water contaminated with trichlorophenol, while two other TCA taints appeared to originate from contaminated oak barrels.

Other investigations

The proportion of other investigations was slightly lower (2%) this year than last year (Figure 9) and also slightly lower (1%) than the 10-year average (Figure 5). Investigations classified as 'other' included gushing issues in sparkling wines, both during disgorgement and upon opening of packaged products, high acidity due to elevated levels of lactic acid, premature development due to heating during transport and settling issues caused by polysaccharides. Two viticultural investigations were conducted on vines suspected to be affected by plant pathogens. In one case *Greenaria* sp. was identified, while *Exserohilum* sp. was identified in the second case. However, in both cases it was concluded that these organisms were unlikely to have caused the observed leaf symptoms; rather, they were likely to be secondary isolates from the leaf samples.

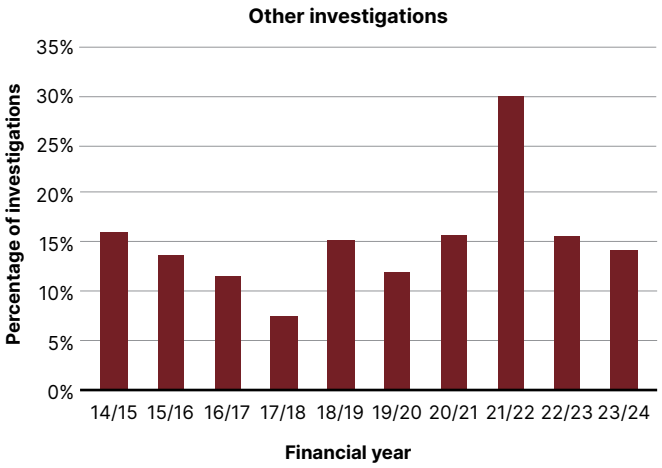

Figure 10. Other investigations conducted by the AWRI helpdesk from 2014/15 to 2023/24

Reference

Parker, M., Jiang, W.M., Bilogrevic, E., Likos, D., Gledhill, J., Coulter, A.D., Cowey, G.D., Simos, C.A., Francis, I.L. Herderich, M.J. 2023. Modelling smoke flavour in wine from chemical composition of smoke-exposed grapes and wine. *Aust. J. Grape Wine Res*. 2023: 4964850.

Library and information services

Staff

Linda Bevin, Rosanne Dunne, Anne Lord

Background

The John Fornachon Memorial Library holds one of the largest collections of grape and wine resources in the world, with more than 115,563 print and digital resources on offer via a range of information discovery tools and services. The library supports the Australian grape and wine sector by providing access to technical information that assists learning, understanding and adoption of research outcomes.

Library resources

During the year, the library added 2,335 new resource records (including eBooks, books and articles) to its database. Users can search for resources via the library catalogue on the AWRI website. The online eBook library now holds 333 fully accessible eBooks. The most heavily used titles are on topics including wine science, wine quality, sparkling wine production, red wine technology, team management and soil health.

Staff publications

The staff publications database, accessible via the AWRI website, holds more than 2,400 AWRI-authored articles. Most publications are open access or freely available, with links directly to the full text. This year, the database received more than 9,519 hits. Additionally, a total of 1,098 staff publications were requested and delivered by the library under copyright exemptions.

Online information packs

Online information packs are recommended reference lists with a specific topic focus, which provide growers and winemakers with access to highly curated and relevant information. The demand for information packs remains high, with the library responding to 563 requests and despatching 1,617 articles via these resources.

Library reference and information requests

The library responded to 1,754 requests for information, including literature searches, article and book requests, research assistance and advice on copyright. This is an increase of 35% from the previous year. A total of 2,801 articles were supplied (Table 4) with staff seeing an 18% increase in articles requested from the *Technical Review* collection.

Table 4. Articles supplied from library collections in 2023/24

Article type	Number of items supplied
AWRI staff publications	1,098
Technical Review collection	668
Library reprint collection	1,035
Total	**2,801**

Performance, products and processes

There are numerous processes involved in wine production, from grapegrowing all the way through to delivery of finished product to consumers. Projects under this theme aim to optimise these processes and reduce costs, resulting in overall improvements to wine quality and business sustainability. Specific areas include grape and wine flavour; wine stability and processing efficiency; optimisation of primary and secondary fermentation; development of new winemaking microorganisms; and production of no- and low-alcohol wines.

Staff

Sheridan Barter, Dr Marlize Bekker (to 11 August 2023), Dr Jenny Bellon, Eleanor Bilogrevic, Dr Keren Bindon, Dr Anthony Borneman, Dr Peter Costello, Russell Desmond, Dr Damian Espinase Nandorfy (to 28 June 2024), Dr Toni Garcia Cordente, John Gledhill, Prof. Markus Herderich, Kieran Hirlam, Dr Josh Hixson, WenWen Jiang, Stella Kassara, Allie Kulcsar, Dr Darek Kutyna, Dr Deanna Langone, Desireé Likos, Jane McCarthy, Dr Agnieszka Mierczynska-Vasilev, Dr Simon Nordestgaard, Dr Cristobal Onetto, Dr Mango Parker, Dr Wes Pearson, Lisa Pisaniello, Song (Luke) Qi, Tim Reilly, Dr Joe Rossi, Dr Simon Schmidt, Alex Schulkin, Neil Scrimgeour, Dr Tracey Siebert, Mark Solomon, Don Teng, Dr Cristian Varela (to 4 August 2023), Flynn Watson, Dr Eric Wilkes.

Students

Stephanie Angela (University of Adelaide), Zhanshu Deng (University of Adelaide), Yanina Giordano (University of Adelaide), Jana Hildebrandt (University of South Australia), Yu Hou (University of Adelaide), Yiming Huo (University of Adelaide), Helly Jadav (Flinders University), WenWen Jiang (University of Adelaide), Ysadora Mirabelli-Montan (University of Adelaide).

Visiting students

Antonia Boeckel (University of Bonn), Evodie Dufay (University of Reunion Island), Tabea Soncksen (University of Braunschweig).

Collaborators

AB Biotek (Anthony Heinrich); Accolade Wines (Vanessa Stockdale); Australian Grape & Wine (Anna Hooper); Australian National University (Prof. John Bekkers); Australian Vintage Limited (Tom Dusseldorp, Emily Harper, Jamie Saint); Burch Family Wines (Richard Burch); CASS Food Research Centre (Assoc. Prof. Robert Shellie); Castle Mountain Enterprises (Kate Heath); Chr Hansen (Duncan Hamm, Nicolai Staugaard, Amanda Tanga); CSIRO (Dr Shaoyang Wang); Deakin University (Prof. Russell Keast); De Bortoli Wines (John Coughlan); DogRidge (Fred Howard); Domaine Chandon (Kat Herd); DrinkWise (Simon Strahan); Endeavour Drinks Group (Jeff Barter, Michael Calloway, Greg Edwards, Steve Faulkner, Darren Leivers, Claire Maxwell); Firmenich (Nicholas Garfield); Flavourtech (Paul Ahn, Michael Craig, Leon Skaliotis); Geoff Flight; Flinders University (Dr Dennis Palms, Prof. Krasimir Vasilev); Fourth Wave Wines (Corey Ryan); Gulbali Institute, Charles Sturt University (Prof. Andrew Clark, Dr Sijing Li, Dr Xinyi Zhang); Hill-Smith Family Estates (Greg Nattrass, Louisa Rose, Stephen Summers); Hither & Yon (Malcolm Leask); Hochschule Geisenheim University, Germany (Prof. Doris Rauhut); Hugh Hamilton Wines (Nic Bourke, Mary Hamilton); Impact Innovation Group (Heather Buys, Angus Crossan, Madelyn Goodrick); Indonesian Institute of Sciences, Indonesia (Dr Satriyo Wahono); Laffort (Alana Seabrook); Lallemand (Jason Amos, Dr Eveline Bartowsky); Margaret River Wines (Amanda Whitehead); Marks & Spencer, UK (Dror Nativ, Bryony Wilkinson); Mercer Wines (Aaron Mercer); Moorak Wines (Jordan Hein); Mount Langi Ghiran (Damien Sheehan); NSW Department of Primary Industries (Dr Katie Dunne); Orbis Wines (Lauren Langfield); Michael Papageorgiou; Patritti Wines (Ben Heide); Pernod Ricard Winemakers (Darryn Hakof, Allira Lord, Dr Jean Macintyre); Range Life Wines (Cam Marshall); Darren Schubert; Seppeltsfield (Fiona Donald); Stellenbosch University, South Africa (Prof. Wessel Du Toit); Tarac Technologies (Jeremy Blanks, Greg Jackson); Taylors Wines (Mitchell Taylor); Tolley Viticulture (Simon Tolley); Treasury Wine Estates (Jeanne Cate, Emma Fotia, James Godfrey, Jorge Henry, Iain Jones, Kym Schroeter, Alison Soden); University of Adelaide (Assoc. Prof. Sue Bastian, Assoc. Prof. Armando Corsi, Assoc. Prof. Rebecca Dolan, Assoc. Prof. Chris Ford, Assoc. Prof. David Jeffery, Assoc. Prof. Jenny Mortimer, Dr Richard Muhlack, Dr Cristian Varela, Prof. Kerry Wilkinson); University of Bordeaux, France (Prof. Philippe Darriet); University of Queensland (Dr Marlize Bekker); University of South Australia (Dr Miguel de Barros Lopes); University of Tasmania (Prof. Robert Shellie); VA Filtration/Memstar (Katy Cordova, David Wollan); Vine to Wine to Market, New Zealand (Dr David Jordan); Vintelligence (Lucy Clements); Wine Australia (Dr Paul Smith).

Flavour attributes of significance to growers and winemakers

Background

The aroma and flavour of wine are mostly directed by a large number of volatile aroma compounds. Often different wine varieties only differ in the proportions of such volatile aroma compounds. Yet, some important aroma compounds can have a strong contribution to wine flavour but only be present at trace concentrations, with extremely low aroma detection thresholds. These compounds have a strong influence on perceptions of quality for consumers. The ability to understand and measure key volatile compounds is important, while also developing practices for grape and wine producers to influence flavours associated with wine quality and style.

Factors that promote 'flint' and 'struck match' flavours

A paper on 'flint'/'struck match'/'mineral' aroma research was published earlier this year (Espinase Nandorfy et al. 2023). This paper highlights the importance of 2-furylmethanethiol (2FMT) in 'struck flint' aroma in Chardonnay wines as well as the known potent aroma compound, phenylmethanethiol (PMT). This research also demonstrated that consumers' responses were polarised by high 'flint' wines, with the most-liked wine being both moderately 'flinty' and 'fruity'.

While oak contact is known to be important for the formation of 2FMT, investigations of the biochemical and chemical formation pathways for PMT are continuing. Previous studies under both laboratory- and small-scale winemaking conditions in Chardonnay showed that a range of practical winemaking strategies are important drivers of the final concentration of PMT in wine, including yeast strain selection, the initial nutritional level of the grape must, and the use of organic nitrogen nutrients pre-bottling. These strategies were validated in commercially produced barrel-fermented Chardonnay wines in the 2023 vintage.

Following on from earlier model experiments, investigations into the effects of pH and metal ions (copper and iron) on PMT formation in laboratory-scale fermentations confirmed the formation of PMT is promoted at lower pHs (3.0 and 3.5 vs 4.0), whereas the presence of metal ions decreased PMT concentrations in the finished wines, with copper having a more detrimental effect than iron (Figure 11).

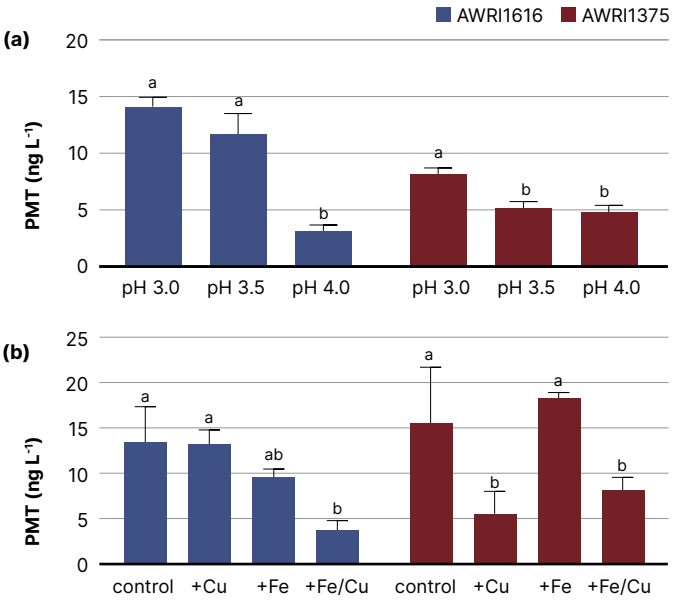

Figure 11. Effect of pH (a) and metal ions (iron and copper) (b) on phenylmethanethiol (PMT) formation during laboratory-scale fermentations in 100 mL of a synthetic grape juice (SGJ). SGJ was supplemented with the putative PMT precursor benzaldehyde to mimic the extraction of this compound during barrel fermentation conditions. The performance of two wine strains (AWRI 1616, blue and AWRI 1375, red) was also evaluated. The PMT levels (ng L^{-1}) were measured at the end of the alcoholic fermentation. Means with the same letter are not significantly different from each other (Tukey's HSD test, $P < 0.05$) for each of the yeast strains assessed.

Smoke taint

Two useful papers from earlier smoke taint research were published this year (Parker et al. 2024a and Parker et al. 2024b – see Appendix 7). The first explores the chemical basis of desirable and undesirable smoky characters in wine and their origins, understanding that smoky aromas in wine may be considered desirable in some styles and are appreciated in many spirits. This article summarises recent research on sources and sensory assessment of smoky attributes in wine and provides an outlook on opportunities for managing excessive smoky characters.

The second paper highlights the natural abundance of volatile phenols and phenolic glycosides in oaked commercial Australian Cabernet Sauvignon, Chardonnay, Pinot Noir and Shiraz wines made from non-smoke-affected grapes. Analysis of phenolic glycosides and cresols now allows confident identification of smoke effects in wines produced with oak contact, based on rigorous data that confirmed previous assumptions. In contrast, guaiacol is not suitable to distinguish between oak and smoke impacts.

Reference

Espinase Nandorfy, D., Siebert, T., Bilogrevic, E., Likos, D., Watson, F., Barter, S., Pisaniello, L., Kulcsar, A., Shellie, R.A., Keast, R., Francis, L., Bekker, M. 2023. The role of potent thiols in "empyreumatic" flint/struck-match/mineral odours in Chardonnay wine. *Aust. J. Grape Wine Res*. 2023: 8847476.

Wine components and interactions influencing the in-mouth sensory properties of Australian wine

Background

Non-volatile compounds play a significant role in shaping the in-mouth sensory experience of wine, along with important volatile aroma compounds. Since individual compounds usually do not act alone to create specific attributes in beverages and foods, it is crucial to understand how they interact to unravel the mechanisms of sensory perception. The sensory properties experienced in the mouth, such as taste and texture, are recognised as multi-modal experiences. This project aims to address key questions about the compounds in wine that contribute to important in-mouth sensory properties, including tastes like bitterness, savouriness, and sweetness, as well as textural attributes like astringency, viscosity, and fullness. Recent research has found high concentrations of strong-tasting amino acids (such as proline) in Australian red wines from warm regions, which may enhance the value of these wines. Our research will explore how amino acids influence the in-mouth sensory properties of wine by interacting with other important taste-active components. Additionally, the project aims to identify new target compounds, understand their origin and impact on wine, and figure out how these compounds can be managed in the vineyard and winery to create distinct wine styles. A major focus is on understanding the extent to which interactions between compounds (or classes of compounds) underpin sensory responses. The long-term goal is to provide producers with strategies for managing the texture and taste of wine, both in the vineyard and the winery.

Novel techniques to study the mechanisms underpinning wine texture perception

Astringency and viscosity are key mouthfeel attributes that affect the sensory experience of foods and beverages. The specific factors contributing to wine's mouthfeel, especially the different types of astringency, are not yet fully understood due to a lack of precise measurement methods, including sensory descriptors. Since the loss of salivary lubrication is a key factor in astringency perception, recent studies have used saliva to replicate oral lubrication using a tribometer, an instrument that measures friction (Wang et al. 2021). Using saliva and tannin, the frictional behaviour of saliva-wine interactions has been demonstrated by soft tribology (the study of friction) showing that astringency descriptors such as 'dryness', 'grippiness', and 'roughness' may be caused by the effect of tannin on the salivary film, reducing lubrication and increasing friction. This technique was trialled through collaboration with Dr Shaoyang Wang at CSIRO, with the goal of understanding interactive effects of inherent sweeteners in wine, such as fructose and proline, as well as tannin as a known astringent.

Figure 12 shows the basic outline of a study of wine tannin extracted from, and back-added to, a Shiraz wine. Commercially available fructose and proline were also explored in the study, as these may influence the perception of multiple texture and taste attributes, including reducing astringency and increasing viscosity (Espinase Nandorfy et al. 2022). The Shiraz wine samples with added proline, fructose and extracted tannin were mixed with human saliva and subsequently subjected to soft tribology using a rheometer to investigate the physical properties that might explain wine mouthfeel and textural changes. Statistical evidence supported the hypothesis that increased proline decreased the friction coefficient, behaving similarly to added fructose, providing lubricating properties to the wine/saliva mixture. This finding aligned well with increased ratings of perceived viscosity by sensory panel members when assessing wines with proline and fructose additions. Conversely, samples with additions of extracted tannin increased the friction coefficient and as expected, these samples were rated highly for astringent mouthfeel. All physical effects were found to be linear, with little evidence of interactions. Subsequent consumer testing revealed that the high-proline and high-fructose samples with the most viscous texture and suppressed astringency were most liked by frequent red wine drinkers (n=104). This investigation sheds light on the dynamic relationship between wine macromolecules and perceived wine mouthfeel/texture, which likely influence consumer acceptance of red wine.

References

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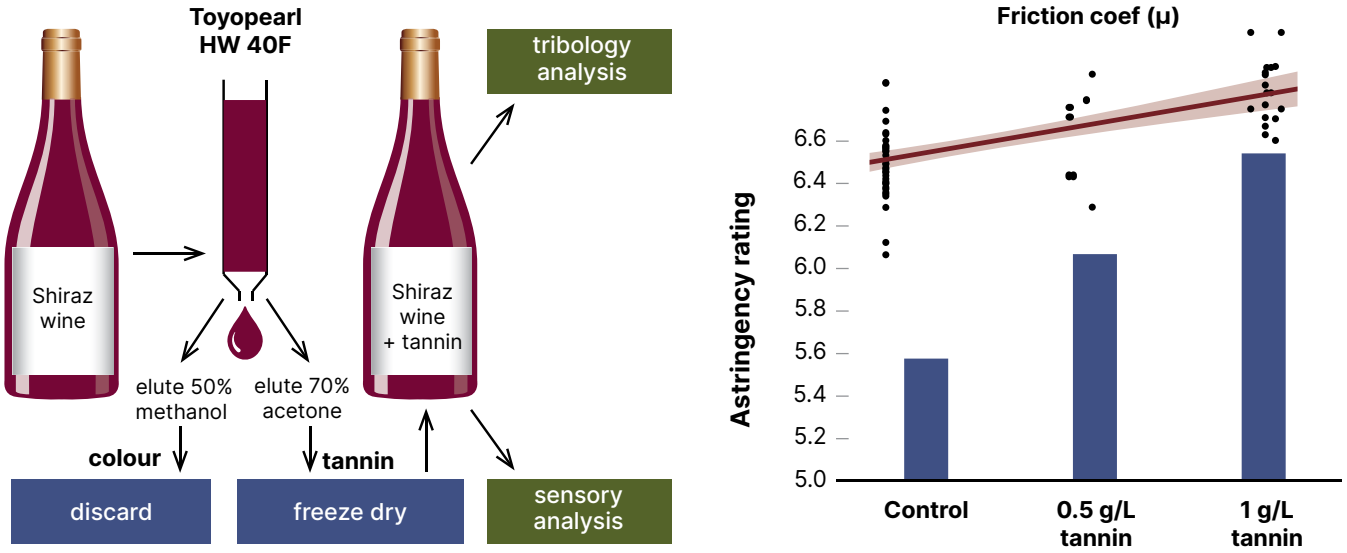


Figure 12. Schematic of experiment purifying tannin from a wine then adding it back to the same wine, showing the effect of tannin addition to increase sensory astringency and the salivary friction coefficient measured by tribology

Addressing production challenges through the management of wine non-volatiles

Background

Non-volatile compounds including phenolics, polysaccharides, proteins (macromolecules) and acids make up most of the wine matrix after ethanol and water. These compounds are crucial for wine quality but can cause issues during production due to their larger size and tendency to interact or aggregate. For winemakers, managing non-volatile composition begins in the vineyard and extends right through to managing the shelf-life of bottled wine. There are many opportunities to influence the behaviour of these non-volatile compounds, affecting their extraction, retention, and conversion during winemaking. During wine production, there are points at which non-volatile compounds can be lost or become unstable and winemakers need strategies to predict and prevent these issues. A key step in managing these compounds is to characterise the colloidal interactions and binding properties of macromolecules in wine, which are not yet well understood. With this knowledge, winemakers and suppliers can develop techniques and tools, such as fining agents or anti-fouling surfaces, to better manage the non-volatile composition and interactions in wine.

Red wine pigments retain their protective capacity against tartrate crystallisation during ageing

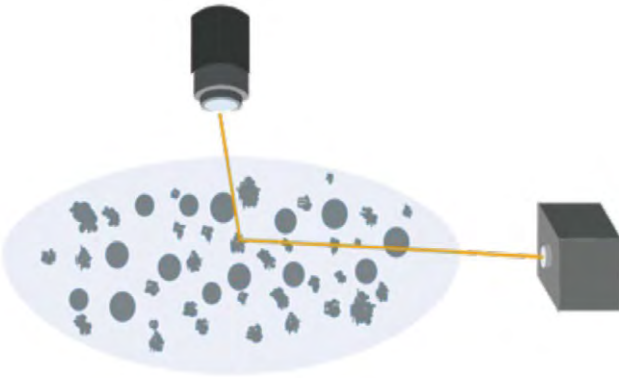
Many wine producers in Australia do not put their red wines through cold stabilisation, relying either on cold winter temperatures to initiate potassium bitartrate (KHT) crystallisation naturally, or because of the long-held knowledge that red wines retain some protection against cold instability due to higher concentrations of polyphenols. Recent AWRI research showed that the main compound providing this protective capacity in red wines was monomeric anthocyanin. Given red wines lose monomeric anthocyanins during ageing (as they are converted into other pigments), it was considered that this might explain why unwanted levels of tartrate crystals may form in some aged red wines.

To investigate this phenomenon, accelerated ageing experiments were conducted on red wines with different levels of polyphenols. For the study, warm-climate wines with high and low anthocyanin concentrations were prepared, with no differences between them in their tartaric acid and potassium concentrations. Wines did not undergo cold stabilisation, but became naturally cold stable following fermentation, and remained stable after three months in bottle. To introduce cold instability, increasing doses of tartaric acid were added to the wines, while maintaining pH. The higher anthocyanin wines showed improved cold stability by the mini-contact test, and these wines had a higher holding capacity for added tartaric acid during chilling. An accelerated ageing experiment for eight weeks at 38°C was performed on both sets of wines with added tartaric acid. Decreases in anthocyanin concentration were observed during the heat treatment, with increases in non-bleachable pigments. Accelerated ageing decreased cold stability (measured by the mini-contact test) and this effect was exacerbated in the low-anthocyanin wines relative to the high-anthocyanin wines. However, absolute changes in cold instability relative to the controls were minor. It was concluded that wine pigments retain some protective capacity against KHT crystallisation even when no longer in the monomeric form. Although these results support general practices that pay less attention to the cold stabilisation of red wines than white wines, the fact that cold instability could be introduced by tartaric acid addition showed that the timing of acid additions should be carefully managed in order to allow the wine to naturally crystallise unstable KHT. Late additions of tartaric acid may disrupt the natural cold stability of red wines, potentially causing crystallisation in bottle.

Adding fluorescence detection to nanoparticle tracking analysis

Nanoparticle tracking analysis (NTA) uses light scattering to detect and measure nanoparticles and molecules. In this process, a laser beam illuminates a sample, and the scattered light is detected by a camera. This technique primarily measures the size, concentration and distribution of nanoparticles and molecules based on their scattered light intensity and movement in the fluid. As a physical detection method, it does not provide any chemical discrimination. To achieve more specific particle characterisation, fluorescence nanoparticle analysis can be employed, which allows for the specific discrimination or detection of sub-populations of particles (Figure 13); for example, those to which a fluorescent label has been added.

(a) Conventional NTA
All particles/molecules unlabelled, equally visible to NTA



(b) Fluorescence NTA
Only labelled particles/molecules are visible to NTA

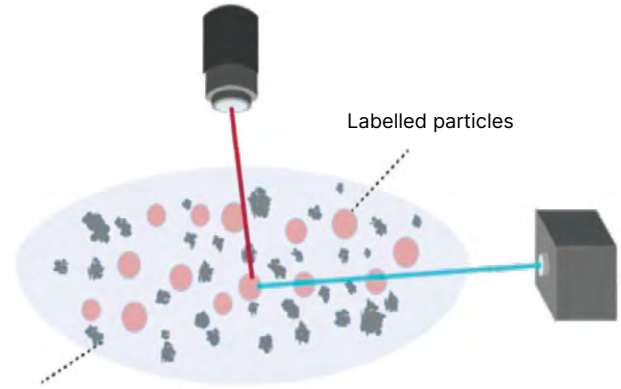


Figure 13. Schematic representation of nanoparticle tracking analysis in (a) scattering and (b) fluorescence mode

At AWRI the extension of NTA into the fluorescence mode (F-NTA) has been a significant advance, resulting in the successful optimisation and validation of Alexa Fluor® 405 (Figure 14) dye conjugated standards for the 408 nm violet laser diode-based F-NTA system. The validation efforts focused on achieving a particle concentration range of 106 to 109 particles per millilitre, a range known to produce statistically reliable and reproducible particle size distributions. This concentration range allows for accurate quantification of particle concentration and size distribution within a measurement time of 30 to 60 seconds.

The successful implementation of these validation protocols has significantly enhanced detection capabilities, enabling the precise study of dynamic molecular interactions through F-NTA. This includes the investigation of interactions relevant to wine, such as protein-polysaccharide interactions, phenolic compound binding, and aroma compound encapsulation. This milestone advances our ability to explore mechanisms underlying wine stability, flavour development and sensory perception and also underscores our commitment to advancing scientific knowledge and developing innovative techniques.

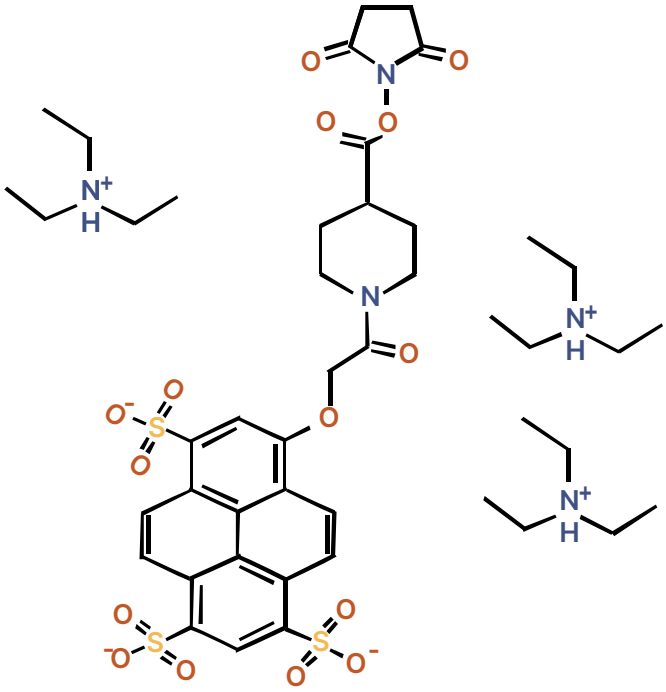


Figure 14. Structure of Alexa Fluor® 405 dye used in fluorescence-nanoparticle tracking analysis

Development of nanoengineered surfaces for mitigation of biogenic amines in wine

Biogenic amines are nitrogenous compounds synthesised by microorganisms, plants and animals, derived from decarboxylation of amino acids and other enzymatic reactions. In wine, biogenic amines may have sensory effects or cause physiological reactions in some consumers. Histamine, tyramine, cadaverine and putrescine are the main biogenic amines found in wines, with their levels influenced by grape variety, growing conditions and oenological practices. The growth of *Saccharomyces cerevisiae* yeast and *Lactobacillus* or *Pediococcus* bacteria during fermentation and ageing can significantly affect biogenic amine levels. According to the OIV, bentonite is the only fining agent used to reduce high levels of biogenic amine levels in wine. However, bentonite has other negative effects on wine aroma, flavour and volume, prompting the search for alternative fining agents.

A novel approach was developed to remove histamine and tyramine from wine. This involved the use of nano-engineered surfaces with plasma polymer coatings rich in amine and carboxyl groups on stainless steel mesh surfaces. Allylamine and acrylic acid were used for plasma polymerisation, with subsequent functionalisation of the allylamine-coated surfaces by adsorption of poly(sodium styrene sulfonate) (PSS) or immobilisation of gold nanoparticles (AuNPs). The results showed that all three surface types effectively adsorbed histamine and tyramine from model wine. PSS-AA surfaces exhibited the highest adsorption capacity for histamine and tyramine, followed by AuNP-AA and acrylic acid surfaces. Figure 15 depicts HPLC profiles of histamine spiked in model wine before and after treatment with the three surface types. The effectiveness of these nano-engineered surfaces in removing histamine and tyramine now needs validation in real wine samples.

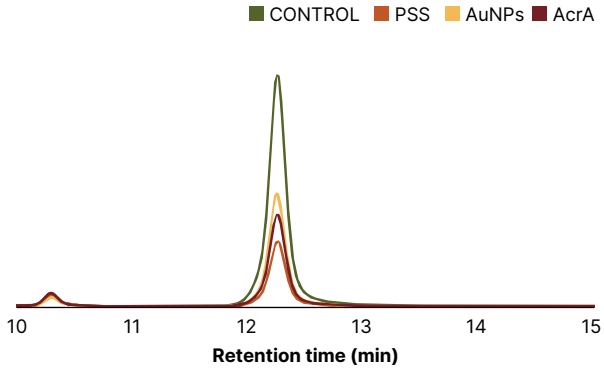


Figure 15. HPLC chromatograms of model wine spiked with histamine, comparing samples before and after treatment with three types of surfaces

As an example, Figure 16 shows UV-Vis spectral profiles of various concentrations of histamine detected by 18 nm gold nanoparticles (AuNPs). As seen in Figure 15, the characteristic peak of AuNPs at 525 nm gradually weakened, while a new peak between 600 and 760 nm progressively intensified with increasing histamine concentrations from 2 to 25 mg/L, indicating changes in electron density due to complexation between histamine and AuNPs. Furthermore, there was a linear relationship between the absorbance ratios (A_{682}/A_{525}) and the logarithmic value of histamine concentrations in the dynamic range from 2 to 25 mg/L. For wine producers, this finding highlights the potential of using AuNPs as a sensitive method for detecting histamine levels in wine.

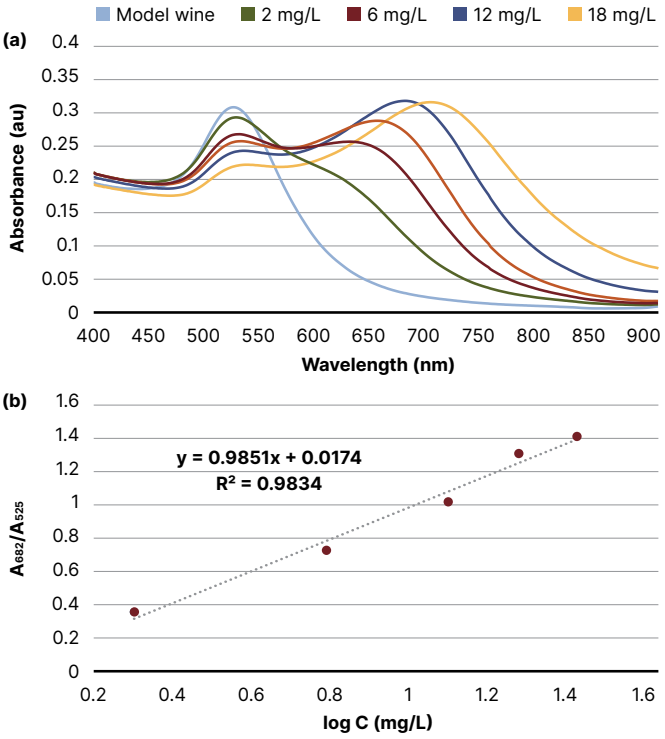


Figure 16. (a) UV-Vis spectra of 18 nm AuNPs in model wine spiked with histamine as a function of histamine concentration, (b) linear relationship between the absorbance ratios (A_{682}/A_{525}) and the logarithm value of the histamine concentrations

Exploring sustainable alternatives to polyvinylpolypyrrolidone (PVPP) in winemaking

Flavanols, particularly catechins, in white wines can oxidise over time, leading to browning and increases in astringency and bitterness. Various methods have been explored to avoid these effects, including gentler pressing, must clarification and the use of inert gases during storage. Polyvinylpolypyrrolidone (PVPP) has been widely used as a fining agent to remove phenolic compounds and prevent browning in white wine. Despite its technological advantages, PVPP is a synthetic plastic polymer that is typically discarded after a single use and is becoming a less attractive option as businesses aim to phase out single-use plastics.

Ongoing research at the AWRI is evaluating commercially available graphene and carbon nanotubes as potential alternatives to PVPP. The aim is to assess their efficacy in reducing the concentrations of phenolic compounds associated with browning and astringency in white wines, comparing them with traditional fining agents such as PVPP and activated carbon. Preliminary findings indicate promising results for both graphene and carbon nanotubes in removal of phenolics from wine.

Table 5 illustrates that at lower concentrations, carbon nanotubes are more effective in removing catechin, epicatechin, caftaric acid and caffeic acid, whereas graphene is more effective at removing gallic acid, tyrosol and grape reaction product (GRP). However, at higher concentrations, specifically 2 g/L, graphene outperforms carbon nanotubes in removing all phenolic compounds except for GRP, where carbon nanotubes show slightly better performance (see Figure 17 for HPLC chromatograms).

Table 5. Concentrations of wine phenolics before and after treatment with carbon nanotubes (CNTs) and graphene. Phenolic concentrations are expressed in mg/L and were measured using HPLC (see Figure 17).

Sample	Gallic acid	Tyrosol	Catechin	Epicatechin	Caftaric acid	Caffeic acid	GRP
Control Riesling	1.62	8.10	5.58	5.02	69.78	4.08	11.0
0.05 g/L CNTs	1.47	8.14	2.86	3.31	60.00	2.48	10.3
0.05 g/L graphene	1.18	7.64	5.03	3.58	69.72	4.13	9.87
0.5 g/L CNTs	1.18	7.48	0.48	1.64	51.03	0.87	1.48
0.5 g/L graphene	1.07	7.64	3.78	1.45	69.22	1.79	10.0
2 g/L CNTs	0.98	6.31	0	1.49	41.57	0.53	0
2 g/L graphene	0.33	6.15	0	0	35.64	0	0.83

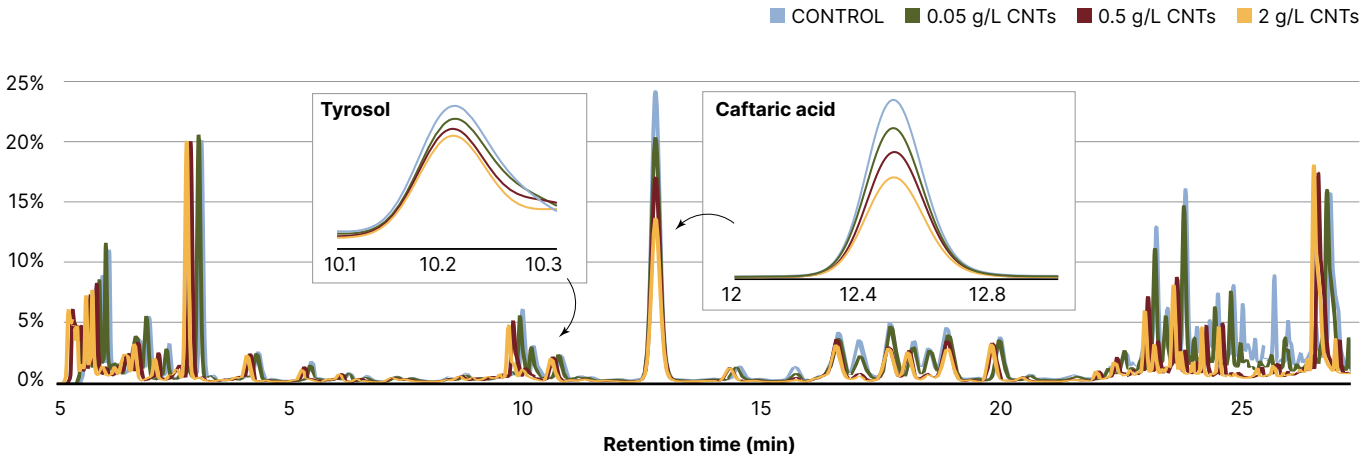


Figure 17. HPLC chromatograms of Riesling phenolics illustrating the effects of treatment with carbon nanotubes at three different concentrations. Inserts show magnified peaks of caftaric acid and tyrosol as representative examples.

Transformative microbiological inputs for innovative winemaking

Background

Classically, the development of yeast and bacterial strains for winemaking has revolved around selection, in which organisms with improved characteristics are chosen explicitly for direct use or as breeding stock. As selection relies on genetic variation, mutagenesis is often used to increase the pool of differences available. However, standard mutagenesis/selection is a random process in which isolates with the required alteration must be identified from a background of thousands of strains. Classical strain development is therefore resource-intensive, limiting the scope of research that can be undertaken.

Recent developments have seen the emergence of new technologies that enable precision genetic editing and engineering of plants, animals and microorganisms. The evolution of these technologies has been rapid, and innovation in this space is constant. The regulatory landscape is also changing, although not at the same pace as technical developments, creating new opportunities for wine microorganism development. This project applies cutting-edge genome editing technologies, such as CRISPR-Cas9, to provide transformative microbiological inputs for the wine industry. Harnessing these techniques will allow the rapid and efficient development of new microorganisms through accelerated breeding to assemble (stack) existing traits that do not frequently co-exist. These non-genetically modified (GM) strains could be directly deployed into the wine industry under a non-GM framework.

In addition, the project is exploring the metabolic diversity afforded by the application of revolutionary synthetic biology techniques to deliver microbial tools that will future-proof the Australian wine industry should regulatory and social license barriers to GM organisms be removed. These synthetic biology-derived organisms can be endowed with entirely new traits, resulting from the introduction of biochemical pathways from diverse sources to enable the production of novel, desirable compounds during fermentation.

CRISPR editing in commercial wine yeast

CRISPR technology represents a significant advancement in genome editing. Depending on the way the genome editing is undertaken, the edited microorganism can satisfy the requirements of a non-GM framework, potentially providing the means for accelerated strain development. The project team has established a CRISPR-based workflow for commercial wine yeast. This workflow enables engineering, and subsequent combining, of multiple desirable traits into a single 'trait-stacked' yeast strain.

In parallel work, the CRISPR system has also been used to promote the introduction of novel biochemical pathways into commercial yeast strains. With this approach the project team is taking advantage of a broader palate of tools associated with advances in synthetic biology. The engineering of whole pathways cannot be achieved in a non-GM framework. However, the approach can generate microbial platforms with capabilities far exceeding those available through other means. Examples of traits accessible using this approach are yeast strains capable of producing very high amounts of desirable flavour and aroma compounds during fermentation.

Fermentation management through optimal microbial consortia

Background

Fermentation management in winemaking is complicated by a range of factors including the different types of fermentation employed (alcoholic and malolactic), the mode of those fermentations (concurrent or sequential, inoculated or not), the style of wine being made and the composition of the fermentation substrate (differences in solids, yeast assimilable nitrogen (YAN) or sugar). The specific strategy employed can shape fermentation outcomes and contribute to unpredictability in a fermentation's overall duration and completeness. This project studies the microbial interactions that support, or sometimes inhibit, efficient fermentation, seeking to identify microbial interactions that are maximally beneficial and minimally antagonistic. In addition, the project explores the recycling of fermentation end-products into nutritional supplements in support of a robust ferment ecosystem. It is hoped that this aspect of the project can optimise process control while reducing reliance on external fermentation aids.

Recycling yeast lees into a fermentation nutrient

Every healthy wine fermentation creates a large amount of biological material. Yeasts increase in concentration more than 100-fold throughout fermentation to yield approximately five grams of dry cell weight per litre. These post-fermentation yeast lees contain significant amounts of embedded nutrients that are usually disposed of as waste at the end of the fermentation process. The question was raised if yeast lees could be recycled, reducing waste and potentially providing a valuable replacement or adjunct to commercial fermentation nutrients. If possible, this recycling process would be a contribution to the wine industry's aims of increasing sustainability by creating a circular economy within the winery.

In a proof-of-concept study, the project team demonstrated that transformation of fermentation lees into a useful product is feasible using resources available in most wineries. Wine lees were effectively sanitised and transformed into a fermentation additive using an enzymatic treatment that supported improved outcomes (decreased fermentation times) in Chardonnay fermentations relative to diammonium phosphate (DAP) addition alone. As little as 20 mL of processed lees per litre of ferment effectively stimulated the fermentation. Lees recovered from the winery or the laboratory were equally effective. In addition, supplementation with treated lees significantly affected the final concentration of fermentation-derived volatile compounds, including esters, volatile acids and higher alcohols. This work provides a promising proof-of-concept approach to waste nutrient recycling. Further research is needed to assess the practicality of these methods in a commercial winery setting.

Enhanced propagation of malolactic bacteria in the winery.

Many wineries practice yeast propagation to generate a sufficient quantity of inoculum, especially at larger scales. Fewer wineries spend the time to undertake bacterial propagation. Perhaps the closest many might come to this is cross-seeding one wine from another that is undergoing a robust malolactic fermentation. The project team has been working on an approach to bacterial propagation that draws on the observation that the growth of malolactic bacteria is aided by the presence of non-*Saccharomyces* wine yeast. Under the right conditions and with the right partner yeast, O*enococcus oeni* concentrations in excess of 10^9 cells/mL can be achieved. Such bacterial concentrations are more than 100-fold higher than is typically achieved during normal malolactic fermentation (MLF).

The propagation approach produces *O. oeni* suitable for simultaneous and sequential MLF, is fast and requires only small volumes of starting material (grape juice and starter culture). In laboratory trials of this propagation approach, 1 L of cultured *O. oeni* contains sufficient active culture to inoculate a 1000 L ferment. In the coming vintage, the team plans to evaluate the approach in pilot-scale winery trials.

CRC-P Advancement of Australian lifestyle wines

Background

The Australian wine sector could be a leading global producer of 'lifestyle wines' – wines lower in alcohol and calories than traditional wines. To achieve this vision, industry-focused research is needed to produce, market and sell no- and low-alcohol (NOLO) wines that exceed consumer expectations. This CRC-P will leverage the resources and expertise of a consortium of industry stakeholders (from across the supply chain) and world-renowned researchers to address key NOLO winemaking challenges: microbial stability and shelf-life, flavour capture and re-use, mouthfeel and textural deficiencies, and the image of NOLO wine. This multi-faceted approach will deliver growth in global markets, and therefore economic benefits for the Australian wine industry.

The primary objectives are to establish the Australian wine sector as the largest global producer of lifestyle (NOLO) wines, and the number one exporter of wines in this category to the US, Europe, South-East Asia and the Middle East. This will achieve growth in global sales, safeguarding the long-term economic viability of the Australian wine industry, while also helping consumers that may be drinking at risky levels to reduce their overall alcohol consumption. These objectives will be met by industry-directed research and product development. AWRI is responsible for delivering the flavour and mouthfeel pillars of the overall project and work commenced on these aspects in February 2024.

Flavour and mouthfeel pillars

In the initial stages of this work, a comprehensive sensory analysis was undertaken on sparkling, white and red NOLO wine products. These sensory evaluations were benchmarking exercises to evaluate current products in the NOLO marketplace. Products were evaluated for their sensory attributes, as well as the panellists' impression of the 'wine-likeness' of the product, based on their experience with wine. This commentary helps producers understand how closely their

product resembles traditional wine, which attributes are associated with wine-likeness, and which are negatively associated with wine-likeness. Process optimisation of the spinning cone instrument located on the Waite Campus was also undertaken, exploring how to increase efficiency of dealcoholisation, in terms of both quality and energy use. Next vintage, winemaking trials will be conducted using grape varieties with unique characteristics that may offer potential for making NOLO products with increased wine-likeness. The project will also evaluate the use of lees and other wine production by-products to aid in improving mouthfeel in NOLO wines.

Impact project portfolio coordination and management

Background

Moving from fundamental discovery research to real-world outcomes for the wine sector is a key priority for AWRI. The impact projects within our Wine Australia project portfolio have been selected due to the potential size of their impact for the wine sector. They are developed in conjunction with potential end-users and the manufacturing or supply chain partners required to put solutions in place, using co-design principles. These projects are funded by Wine Australia and contributions from partners.

Impact project approaches

While still relying on technical solutions, impact projects reflect the idea that real-world solutions are chosen, used or purchased for several reasons, and those reasons vary from person to person. A range of approaches have been applied to understand not only the nature of the problem as it is encountered by different people within their businesses, but also the drivers of success that they are looking for to give them confidence in the proposed solution.

Detailed end-user discussions and understanding have been linked with supply chain exploration, mapping and creation, combined with financial insights, to give rise to a collection of Impact R&D principles. The overlap of quantitative technical and financial information with qualitative end-user understanding is guiding these projects towards endpoints that will help bridge the gap between research and impact and allow for a more rapid recognition of proposed solutions that currently lack viable pathways.

Single-step heat and cold stabilisation

Background

AWRI research over the past five years has revealed that natural zeolites have the capacity to simultaneously heat and cold stabilise white wines. Since most wine producers in Australia stabilise their white wines as a batch process within one tank, there is an opportunity to further improve efficiency of stabilisation as a single-step process in commercial practice. This would allow wineries to replace bentonite addition and cooling, both of which present substantial environmental and economic costs. Born out of a co-design process, an impact project focusing on development of a new zeolite product to improve white wine stabilisation has been established. This product aims to replace current methods by offering both heat and cold stabilisation in one step.

Identifying the need to improve stabilisation processes

AWRI has worked closely with the grape and wine industry, along with Wine Australia and commercial partners, to understand opportunities to improve wine production and quality. From the earliest stages of the consultation and co-design process, making improvements in heat and cold stabilisation practices were identified as important. Depending on winery size and current practices, the reasons for wishing to improve cold or heat stabilisation processes differ. The use of bentonite for heat stabilisation has a significant downside of wine loss through occlusion with lees. Chilling, the most common technique for cold stabilisation, is energy-intensive and therefore costly both in financial and environmental terms. However, the availability of infrastructure such as electrodialysis, high-solids crossflow filtration, or on-site solar arrays has reduced the impact of these downsides for some businesses.

Understanding the market for single-step stabilisation and the regulatory landscape

Efforts are underway, through commercial partnerships, to better understand the market for zeolite as a new stabilisation product and to build business models for the use of zeolite, or other alternative stabilisation products, in the future. Work to understand the regulatory landscape for this type of product has also been important. Feedback from industry has been crucial. Small and medium wineries could benefit most from this technology due to the high cost of wine loss to bentonite lees, as well as the high cost of electricity for cooling. On the other hand, larger wineries will require the technology to work well with their existing processes, such as high-solids crossflow filtration or electrodialysis. Economic studies showed that a new zeolite-based method could lower costs, especially for smaller producers who lack advanced technologies to recover wine from lees. Supply chain models for the sourcing and distribution of stabilisation technologies were mapped and supply partners involved in project direction and progress. Several options were assessed and showed promise, with more insight required on the ability to produce consistently performing products at scale. Future challenges will include meeting current and future regulatory requirements, ensuring consistency in the product, and balancing the costs and benefits of the new technology. Looking ahead, the focus will remain on fostering a collaborative approach for future investments, with potential investors such as Wine Australia, zeolite suppliers and commercial partners.

Smart surfaces

Background

Volatile sulfur compounds (VSCs), such as hydrogen sulfide, methanethiol and ethanethiol, are linked to ‘reductive’ aromas in wine and contribute to approximately 30% of all wine faults. These compounds can have a significant impact on wine aroma, perceptions of quality and consumer preference. A new method to eliminate key VSCs from wine was previously developed by combining chemical and structural surface modifications (Mierczynska-Vasilev et al. 2023). A thin plasma polymer coating was applied to a surface, onto which gold nanoparticles were subsequently immobilised. These gold nanoparticles effectively removed VSCs from wine by forming gold-sulfur bonds, leveraging the strong binding affinity of sulfhydryls to gold surfaces. This specialised surface selectively eliminated sulfidic off-aromas from wine, while preserving desired tropical thiol and ‘gun flint’ aromas, as well as maintaining SO_2 concentrations.

Potential was identified for this smart surface to be integrated into a range of applications in wine production and packaging, such as filtration devices, processing aids, closures or other packaging material. This approach could provide significant benefits over the current method of copper fining commonly used to treat reductive aromas. This impact project aims to understand the market for such applications, working towards providing winemakers with a new remediation strategy for unwanted sulfur compounds and developing a method to regenerate smart surfaces for repeated application.

Understanding surface properties and industry needs

A study on nanoengineered surfaces for removal of sulfur compounds during winemaking yielded significant outcomes and valuable recommendations. It provided crucial insights into the efficacy of stainless steel sheets and gold nanoparticles, emphasising the efficient use of gold nanoparticles in mitigating reductive aromas. The regenerative capabilities of nanoengineered surfaces were also successfully demonstrated, making them practical for reapplication in wineries. An added benefit was that regeneration can be carried out on-site, providing a convenient option for wineries.

Team members spoke with more than 30 suppliers and wine producers across Australia, representing approximately 45% of the total crush. Around 60% expressed a clear demand for an alternative to copper fining that removes reductive aromas but preserves positive wine aroma, flavour and palate weight. These producers wanted to avoid removal of desirable tropical thiol and 'gun flint' aromas, which can occur when using copper.

Assessing costs, benefits and opportunities

The current landscape for smart surface technology in the wine industry presents both challenges and opportunities. Currently, the cost of smart surface technology is significantly higher than that of copper fining. Technological advances are crucial for scaling up smart surface applications and potentially reducing costs to make them more competitive. Key areas for improvement include optimising regeneration capabilities and conducting storage studies to validate long-term efficacy in preventing reductive aromas. The next stage of the initiative will focus on enhancing the economic viability of smart surface technology by increasing its surface area. In conclusion, while smart surfaces offer promising benefits for wine treatment, overcoming cost barriers and addressing market needs will be essential to realising their full potential as a viable alternative to established treatments such as copper.

Reference

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Brettanomyces diagnostics

Background

Brettanomyces yeast, commonly found in wineries, has the potential to cause significant spoilage in wines, through the production of volatile phenol compounds. While there are a number of detection methods for *Brettanomyces*, they all have drawbacks in terms of cost, time or expertise required. This impact project aims to develop a robust, field-deployable diagnostic solution for the early detection of *Brettanomyces* in wine.

Understanding current practice for *Brettanomyces* prevention

Consultation with an estimated 50% of Australia's wine barrel owners showed that while some preventative analysis for *Brettanomyces* is undertaken, most wineries rely on identification via sensory analysis of a batched barrel sample. This practice, which only offers the possibility of remediation rather than prevention, could also miss a problem barrel altogether due to the dilution of spoilage compounds below their sensory threshold. While the current costs of *Brettanomyces* analysis for wineries are low, most of the costs are incurred upon confirmation of a suspect barrel or parcel. At that point remediation options range from the destruction of wine and barrel, to treatment and downgrade of wine, with varying levels of loss incurred. More insights are required to properly understand the value loss of wine downgrades, and this will be a subject of future work.

Prototyping a kit for preventative *Brettanomyces* detection

Development of a winery-deployable detection kit for *Brettanomyces* has been confirmed in laboratory testing, including successful manufacturing of the kits by project partners. These prototypes will be taken into winery trials in the next phase of this work to determine how the analysis workflow fits in with winery laboratory skill sets and processes. It is intended that the same level of skill required to perform SO_2 analysis will allow in-house preventative *Brettanomyces* detection.

Smoke rapid test

Background

It is clear that the wine sector needs a diagnostic test for smoke-affected grapes that reduces turnaround times for results. To deliver the greatest benefit, the test must be able to be deployed regionally. This would address delays caused by sample transport as well as high numbers of samples needing analysis during large-scale smoke events. Mid infra-red (MIR) technology has the potential to offer such a solution, and a proof-of-concept model has already been developed. This impact project aims to progress knowledge about the market for such a test, specifically how the product or service is best delivered, and engage with key supply chain partners to develop the business model(s). The most promising options will be explored to understand the economic aspects as well as opportunities and benefits for the sector. Key stakeholders include regional associations, large grape and wine companies, technology providers and testing providers.

Building compelling evidence for investment to develop the smoke rapid test

Technical performance alone is not enough to invest in developing an idea into a product or service to take to market. The emphasis in this first year has been on building evidence about the market and supply chain and conducting financial modelling to ensure these aspects are all viable. Market insights have been expanded and evolved through surveys and conversations with wine industry businesses as well as key regions and industry organisations. Subsequently, the value proposition of MIR for rapid smoke assessment has been validated against competing approaches, products, services or practices.

Several business models were explored, in collaboration with industry and supply chain partners, to test supply chain models. Requirements to deploy instrumentation and a calibration model were identified, including potential types of partners or manufacturers. For a number of options, the roles and responsibilities were defined for the supply chain partners who would need to deliver the technology, products or services. Three supply chains were explored, with benefits and drawbacks for different market segments. The costs and benefits to end-users to adopt the rapid test were estimated for in-house testing and for access to a smoke rapid test service in-region. The greatest benefit of the test is to avoid the major costs of making incorrect processing decisions due to delayed results. In the worst case scenario, this results in wine that is unfit for sale and must be dumped, incurring significant costs of production and loss in wine sales.

Market insights showed that the wine sector continues to see value in a diagnostic test for smoke-affected grapes that reduces turnaround times for results. To avoid complicated and costly sample logistics, and deliver the greatest benefit, the test must be able to be deployed regionally. This would not only address delays in sample transport, but would also prevent delays in processing decisions caused by analytical turnaround times and, most importantly, avoid delays caused by backlogs of high sample numbers during large-scale smoke events.

Technical progress on the smoke rapid test

The 2023/24 summer and autumn were predicted to have an El Niño weather pattern, with higher incidence of fires and therefore smoke in viticultural regions. This would have provided samples of grapes exposed to smoke to validate the rapid test, but in fact there were fewer samples than average available for testing the model. Bunches of grapes were exposed to smoke off the vine to expand the selection of samples available to test the model. Work is continuing on developing a robust model for assessing smoke exposure in grapes.

Environment, sustainability and natural capital

The success of the Australian grape and wine industry is strongly tied to its long-term custodianship of the natural environment. Soil, water, biodiversity and climate all contribute to the success or failure of grapegrowing across Australia. Electricity, fuel, refrigeration and waste disposal are all major costs in winemaking. Projects under this theme aim to assist producers to improve environmental, social and economic performance; to adapt to the challenges of a variable climate; to make the most of the grapevine clonal resources available; and to improve management of pests and diseases.

Staff

Dr Anthony Borneman, Danielle Carter, Laura Hale, Prof. Markus Herderich, Wen-Hsiang (Denny) Hsieh (to 2 November 2023), Dr Mardi Longbottom, Anne Lord, Dr Simon Nordestgaard, Dr Cristobal Onetto, Liz Pitcher, Dr Rochelle Schlank, Steven Van Den Heuvel, Dr Cristian Varela (to 4 August 2023), Dr Chris Ward.

Students

Bryce Polley (QUT, Food Agility CRC)

Collaborators

ARM Nursery (Steve Partridge); Australian Grape & Wine (Anna Hooper, Lee McLean); Brown Family Wine Group (Brett McClen, Joel Tilbrook); Chalmers Wines (Kim Chalmers); CSIRO (Paul Boss, Arryn Clarke); Food Agility Cooperative Research Centre (Michael Schaefer); Freshcare Ltd (Kerrie Barker, Fiona Grime, Jane Siebum, Angela Steain); Hill-Smith Family Estates (Greg Nattrass, Louisa Rose, Stephen Summers); Howard Park Wines (David Botting); Impact Innovation Group (Angus Crossan); Pernod Ricard Winemakers (Dr Jean Macintyre); SARDI (Dr Ismail Ismail, Assoc. Prof. Paul Petrie, Dr Mark Sosnowski); schools across Australia; South Australian Vine Improvement Association (Chris Bennett); Sustainability Advisory Committee (Chris Dent, Philip Deverell, John Ide, Jennifer Lynch, Madeline Jarrett, Cath Oates, Michael Parks, Kyra Reznikov, Dr Richard Smart, Lachie Thomas); Treasury Wine Estates (Ben Harris, Lin Lin Low); Western Australian Vine Improvement Association (Richard Fennessy); Wine Australia (Martin Cole, Drea Hall, Alex Sas, Rachel Triggs); Yalumba Nursery (Bethany Collins, Ballie Trenwith).

Supporting the sustainability of grape and wine businesses and Australia's sustainability credentials

Background

Launched in 2019, Sustainable Winegrowing Australia is Australia's national program for grapegrowers and winemakers to demonstrate and continuously improve their sustainability in the vineyard and winery. The program takes a holistic approach to managing, supporting and promoting sustainability and covers environmental, social and economic aspects of grape and wine production. In 2020, Australian Grape & Wine, AWRI and Wine Australia signed a memorandum of understanding outlining the collaborative arrangements for governance and delivery of Sustainable Winegrowing Australia. Sustainable Winegrowing Australia is governed by a joint steering committee with representatives from the three organisations, with their respective roles outlined below:

- Australian Grape & Wine provides oversight and guidance to the program, liaises with the Australian Government and state governments, and consults with the sector's key stakeholders on policy and development.
- AWRI provides program management, membership administration, technical development, and extension and adoption activities.
- Wine Australia provides marketing and communications to help attract and retain members and to promote Australia's sustainability credentials to key stakeholder groups globally.

Continued growth in membership and trust mark use

Membership of Sustainable Winegrowing Australia continued to grow, reaching 1,479 members in 2023/24, increasing from 1,227 in the previous year. Members are located in 55 wine regions and represent 51% of Australia's vineyard area, with 71% of the national crush in vintage 2024 processed in member wineries. The proportion of members achieving certified status also grew, from 52% in 2022/23 to 60% in 2023/24. Almost one-third (32%) of Australia's wine-grape vineyard area is now covered by Sustainable Winegrowing Australia certification. With the growth in certification, adoption of the trust mark has also increased, with more than 700 wine labels bearing the trust mark and the equivalent of 96.1 million bottles of wine qualifying for trust mark use. The trust mark is only available for use by certified members.

Training and support

During the year the Sustainable Winegrowing Australia team delivered certification training to 383 participants across 47 regions. Members preparing for certification were supported in additional online sessions. The team also responded to more than 2,500 sustainability-related enquiries, on topics including general information about the program, new memberships, sustainable practices, data, and technical support for certification.

The project team extended support to regions through monthly online regional forums, which included representatives from regions where adoption of Sustainable Winegrowing Australia is a key priority. These meetings enabled identification of common issues across the regions and helped to amplify key messages. A number of regions have begun reporting regional Sustainable Winegrowing Australia data back to their members. They are also using it in regional promotions and to identify targets for regional extension and adoption programs.

The third Sustainable Winegrowing Australia Impact report was published, highlighting member performance improvements since 2020. A couple of highlights included almost five times more members prioritising energy efficiency and a similar increase in members taking action to reduce waste diverted to landfill.

Generating value from ferment carbon dioxide

Background

Wineries have recently experienced shortages in local supply of carbon dioxide and elevated prices for imported carbon dioxide. There is therefore interest from wine producers in potentially capturing and using the carbon dioxide emitted from their own ferments. This impact project is evaluating different options for capture and use of fermentation carbon dioxide, including assessing their economic performance and solving technical challenges associated with carbon dioxide capture that are specific to wineries.

Initial calculations

Fermentation emits around 80 kg of carbon dioxide from each tonne of grapes fermented (the exact amount varies with grape sugar content and yield). Data were collected from five large wineries on their grape intake and carbon dioxide use. Ferments at all the wineries generated much more carbon dioxide than was purchased over the last three years (between 1.8 and 30 times), although not all of the ferment carbon dioxide would be easily recoverable. The wineries with on-site packaging, tank sparkling wine production and those more focused on white wine over red wine generally used relatively more carbon dioxide. The seasonality of carbon dioxide production in the wine industry makes capture and reuse much more difficult than in the beer industry, because it dictates relatively larger systems that are only operated for part of the year, and multiple large carbon dioxide storage tanks. Various options to try to manage this seasonality are currently being explored. Given that carbon dioxide is currently a by-product of industries that are closely linked with fossil fuels, the long-term carbon dioxide supply for the wine industry and other industries is uncertain, as the economy decarbonises. It is therefore worthwhile to try to identify economically viable ways to use winery fermentation carbon dioxide.

2024 experiments

In initial experiments in the 2024 vintage, carbon dioxide removal pipework was installed on four white fermenters and four red fermenters at a large winery, to understand some of the practical operational challenges in removing carbon dioxide from winery fermenters and to assess the purity of the carbon dioxide generated. PVC pipework was mainly used to direct the carbon dioxide away and optical oxygen sensors, flow meters and pressure gauges were fitted on each tank. The oxygen sensors were a good means of monitoring and logging approximate purity in real time. Purity was also measured based on the reaction of the ferment gas with potassium hydroxide solution, using a device commonly used in breweries. In addition, a small number of gas samples were collected and sent to specialist overseas carbon dioxide analysis labs. Apart from moisture, the carbon dioxide was found to be very pure, greater than 99%. After water, the largest contaminant was ethanol. Carbon dioxide samples from red ferments had higher levels of impurities than samples from white ferments, which is perhaps not surprising

given red ferments are performed in contact with skins, at higher temperatures and at faster fermentation speeds. Concentrations of sulfur compounds in the red ferment carbon dioxide were also above the International Society of Beverage Technologists carbon dioxide standard. Winery ferment carbon dioxide gas will therefore likely need some treatment before storage and reuse, particularly if it is to be used for more than just ullage management.

Several operational challenges were encountered with the arrangement installed for the 2024 vintage, mainly relating to the pipework coming off the tank lid. This lid-based system was suitable for a trial and generated much useful information, but would be too unwieldy for a permanent installation. An installation planned for the 2025 vintage will use pipework coming from the tank neck. Various observations were also made on tank pressures, relief valves and system drainage that will influence the design for the 2025 vintage installation.

Genetic diversity of Australian wine grapevine germplasm

Background

Grapevine planting material represents a major investment and critical production asset for the Australian wine industry, but the genetic diversity that is present in Australia is poorly understood. While grapevine cultivars can be unequivocally typed by ampelography and/or genetic tests, clonal identification solely relies on the tracing of supply records to the point of origin. Such records are not always available or reliable, particularly for older accessions.

Whole-genome sequencing provides the most highly detailed methodology for defining grapevine cultivars and, more importantly, clones of those cultivars.

AWRI scientists have developed a world-first clonal sequencing methodology that combines the latest next-generation genome sequencing technologies, high-performance computing and customised bioinformatics tools. This technology is being used to assemble a foundational database containing hundreds of grapevine clonal genomes that can robustly identify the majority of grapevine varieties and clones of economic importance within Australia.

A genetic catalogue of Australian grapevine germplasm

Whole-genome data was collected for more than 1,100 grapevine samples across 35 varieties, representing the majority of commercial wine-grape clonal material available in Australia. By comparing genetic relatedness of samples using unique DNA fingerprints, cultivar-specific family trees were produced that enabled the clustering of samples into robust clonal genetic groups (Figure 18). Comparison of genetic groups with the presumed clonal identity allowed for the detection of both synonymous clonal names (different clonal names, same genetics), and potential cases of naming inconsistencies, in which the supplied sample name was inconsistent with its genetic fingerprint. This dataset will now be used as a basis to investigate the practicality of providing a genetic test for grapevine clonal identity, through the Wine Australia-funded impact project framework.

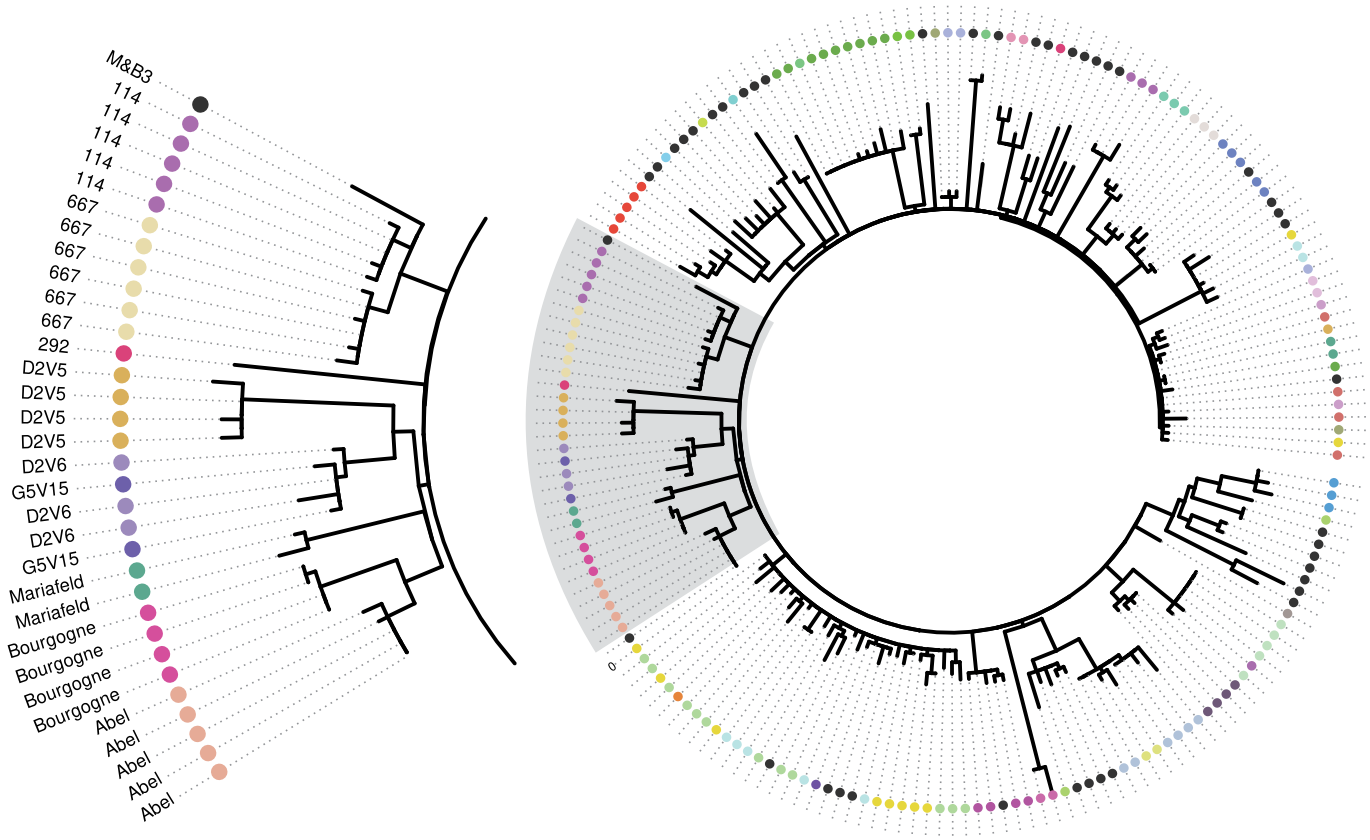

Figure 18. Clonal genetic clustering of Pinot germplasm. Results are shown for all project samples (right) with a zoom in of the shaded area depicted on the left. Nodes are coloured by the presumed clonal identity.

Citizen science – Yeast catchers

Background

Yeasts and other fungi are vital to baking, brewing and the production of many pharmaceuticals and biofuels. Despite their utility, the diversity of yeasts within Australia is still largely untapped. New species and strains provide natural biological diversity that can create opportunities for future agricultural and food production and the transition to a bio-based economy.

AWRI has been working with school students around Australia on a citizen science project called 'Yeast catchers' looking for undiscovered Australian fungal species. This project was funded by a Citizen Science grant from the Australian Government Department of Industry, Science and Resources, as part of a program that seeks to engage the public in scientific research projects. The project aimed to isolate yeasts endemic to Australia, while introducing real-world scientific research into Australian schools.

Insights into the diversity of yeast in the Australian environment

A combination of face-to-face workshops with presentations and practical exercises and online video conferencing were used to connect with students in 55 schools, with at least one school in all Australian states and territories. More than 3,300 students participated in the Yeast Catchers framework, encompassing students from Reception to Year 12, with the program modified according to age group. Sessions consisted of a workshop that covered the world of yeasts and laid the background for the project. Schools were provided with more than 3,000 sample tubes, which were used by the student scientists to attempt to capture natural yeasts by adding environmental samples (flowers, gumnuts, soil, etc.) to a selective growth media.

More than 6,000 individual yeast isolates obtained from over 750 positive samples were assessed to determine their species using DNA-based microbial profiling techniques. In total, 113 different yeast species were identified. In addition to those samples that could be characterised to a species, there were 790 isolates across 29 genera that could only be identified to the level of genus and 316 isolates that could not be assigned to the genus level and remained as 'unassigned' at the taxonomic level. From a biotechnological viewpoint, examples of species commonly used in industrial fermentation including *S. cerevisiae* (6% of isolates) and *Torulaspora delbrueckii* (9% of isolates) were encountered, which fits with the growth characteristics that were targeted by the enrichment media. However, yeasts with more diverse phenotypes such as the ability to utilise methanol (*Ogatea* spp. and *Candida boidini*) or hydrocarbons such as kerosene (*Candida parapsilosis*) as carbon sources were also isolated, although at low frequency. This was the final year of this citizen science project.

Understanding the basis of agrochemical resistance in biotrophic grapevine pathogens

Background

The development of resistance to agrochemicals is an ever-increasing problem in agriculture, including in viticulture. Results of recent SARDI/AWRI research projects have shown that there is widespread prevalence of known resistance alleles to many of the commonly used agrochemicals in the main biotrophic grapevine pathogens *Erysiphe necator* (powdery mildew) and *Plasmopara viticola* (downy mildew). This project is collaborating with SARDI, moving beyond mapping of the prevalence of resistance alleles using whole-genome sequencing towards simultaneously assessing all known resistant loci, in addition to providing population data regarding the evolution of these traits in the field.

Sensitivity of downy mildew to selected fungicide groups and occurrence of the G143A mutant

A collaborative article between SARDI, the Western Australia Department of Primary Industries and Regional Development and AWRI was published on the prevalence of agrochemical resistance alleles in downy mildew (Ismail et al. 2024 – see Appendix 7). Genetic analysis was performed to detect the G143A mutation responsible for resistance to quinone outside inhibitor (QoI, group 11) fungicides, in addition to the G1105S mutation that produces resistance to carboxylic acid amide (CAA, group 40) fungicides. Amplicon-based sequencing was performed for 239 and 65 isolates collected in 2014-2017 and 2017-2022, respectively, with the G143A mutations observed in 8% and 52% of isolates, respectively. The G1105S mutation was not detected in any isolates and is yet to be observed in Australia.

Foundational data and support services

The research, development and extension activities of the AWRI are underpinned by an efficient service capacity that provides and supports infrastructure; delivers research support and analytical services; manages governance, legal and financial affairs, information technology and workplace safety; and generates foundational data sets.

Staff

Farimah Arshadi (from 12 February 2024), Dr Regina Baaijens (from 4 September 2023), Caroline Bartel, Sheridan Barter, Ida Batiancila, Eleanor Bilogrevic, Catherine Borneman, Natalie Burgan, Danielle Carter, Cerys Colquhoun, Susanne Copeland, Alfons Cuijvers, Georgia Davidson, Russell Desmond, Dr Zung Do, Shiralee Dodd, Damian Espinase Nandorfy (to 28 June 2024), Angus Forgan, Assoc. Prof. Leigh Francis, Josephine Giorgio-Ion, John Gledhill, Robyn Gleeson, Jesse Hall, Karloskar Hall (from 13 November 2023), Kate Hardy, Alex Hennig (to 15 September 2023), Thomas Hensel, Prof. Markus Herderich, Kieran Hirlam, Dr Josh Hixson, Adam Holland (to 9 February 2024), Orlando Holzapfel (from 3 June 2024), Leanne Hoxey, Wen-Hsiang (Denny) Hsieh (to 2 November 2023), Dr Vilma Hysenaj, WenWen Jiang, Pauline Jorgensen, Dr Mark Krstic, Jillian Lee, Joshua Lennon, Liam Lepore (from 17 June 2024), Desireé Likos, Susan Lincoln, Dr Natoiya Lloyd, Dr Simone Madaras, Jacinta McAskill, Emily Milsom (to 28 June 2024), Dr Emma Muehlberg (to 3 May 2024), Bryan Newell, Peter Nguyen, Dr Luca Nicolotti, Dr Simon Nordestgaard, Jennifer O'Mahony, Dr Wes Pearson, Lisa Pisaniello, Ella Robinson, Dr Tony Robinson, Kyla Schmidt, Marco Schoeman, Jessica Schrapel, Neil Scrimgeour, Gina Sellars, Dr Tracey Siebert, Con Simos (to 8 November 2023), Dean Smiley, Mark Solomon, Pamela Solomon, Dr Yihe (Eva) Sui, Fang Tang, Dr Maryam Taraji, Don Teng, Heather Tosen, Will Walker (from 11 July 2023), Flynn Watson, Kylee Watson, Dr Rachel West, Dr Matthew Wheal, Dr Eric Wilkes, Dr Patricia Williamson, Ching Yee (Hebe) Wong (from 22 January 2024), Dr Qi Wu, Sara Zhan.

Collaborators

AB Biotek (Dr Anthony Heinrich, Dr Tina Tran); Australian Institute for Bioengineering and Nanotechnology, University of Queensland (Dr Esteban Marcellin Saldana); Campden BRI (Peter Headridge); CellR (Jack Heise, Daniel Hill); Compusense, Canada (Ryan Corrick); Domaine Chandon (Dan Buckle, Richard McCaughey, Nicole Tracey); Enartis (Lorenza Allen, Greta Lanfranchi); ETS Laboratories, USA (Gordon Burns, Eric Herve); Fermentis (Joseph Pitt); Gurra Downs (Dave Reilly); Hunter Bottling Company (John Chenery, Russell Smith); Mass Spectrometry and Proteomics Facility, University of South Australia (Prof. Peter Hoffmann); OneBasin CRC (Dr Mike Stewardson, Assoc. Prof. Seth Westra), PIRSA (Dr Hannah Brown, Jo Collins, Caitlin Davies); South Australian Genomics Facility (Prof. David Lynn); Tarac Technologies (Jeremy Blanks, Greg Jackson); Treasury Wine Estates (Dr Marcos Bonada, Dr Catherine Kidman); University of Adelaide (Prof. Jason Able, Prof. Robert Falconer, Assoc. Prof. Christopher Ford, Dr Lukas Gerstweiler, Assoc. Prof. Paul Grbin, Prof. Anton Middleberg, Dr Michael Millan, Sanjee Peiris, Prof. Kerry Wilkinson); University of Melbourne (Prof. Malcolm McConville); University of Western Australia (Assoc. Prof. Michael Clarke); VA Filtration/Memstar (Matthew Hooper, Nigel Sneyd).

Efficient administration

Background

AWRI's management and administration is carried out by a dedicated team of specialists who work together to provide leadership, infrastructure, financial, human resources, legal, contract management, risk management, workplace health and safety, corporate governance and IT services across the organisation. The team's objective is to enable all AWRI staff to focus on their core capabilities to ensure that the organisation is able to meet its objectives, and in turn the expectations of stakeholders. The team works closely with the AWRI Board, which provides additional leadership and oversight to all AWRI activities.

Business development/commercialisation

During the year, AWRI strengthened its strategic partnerships and secured additional funding to support research and innovation in the wine industry. Notable achievements included executing a subcontractor agreement with Bioplatforms Australia worth $4.76 million over five years, supported by an additional $2.78 million grant from the South Australian Government. The AWRI-University of Adelaide 'Friendship Fund' awarded over $384,000 to collaborative projects, demonstrating the value of this partnership. The successful CRC-P grant application on improving the quality of NOLO wines (worth $6.70 million over three years) was formalised through research agreements with industry partners. WIC Winemaking Services has received inquiries from more than 24 companies interested in creating new products using the NOLO trial-scale research facility at the Waite Campus. Multiple grant applications were submitted, with several successful outcomes, including partnerships in the ARC Centre of Excellence for Mathematical Analysis of Cellular Systems, an ARC Linkage Infrastructure, Equipment and Facilities (LIEF) grant for ion mobility-mass spectrometry, the ARC Training Centre in Plant Biosecurity, and an ARC Early-Career Industry Fellowship awarded to Dr Mango Parker. Commercialisation strategies within the impact project framework are focused on bringing new technologies to market.

Finance

Core finance activities included the provision of accounting, budgeting, accounts receivable and payable, payroll, management of cashflow and liquidity, taxation compliance, and compliance with internal financial policies. The finance team also provided reporting to AWRI's management and Board, funding organisations and statutory bodies. Other notable activities included the provision of administrative support for entities such as the Australian Wine Industry Technical Conference, Interwinery Analysis Group and the Wine Innovation Cluster.

Human resources

AWRI's human resources capability is responsible for ensuring compliance with employment conditions and regulations. It manages day-to-day employment activities such as recruitment, induction of new staff, the performance management framework and employer of choice initiatives. AWRI continues to run a Leadership Development Program in line with its strategic objective of attracting and retaining world-class talent. Significantly, during the latter part of the year, AWRI commenced a downsizing program to align our workforce with structural changes taking place within the broader wine industry and anticipated future funding reductions.

Operations

The Operations Manager oversees all AWRI infrastructure, equipment and engineering requirements; supervises procurement of consumables; and chairs AWRI's Safety Advisory Committee. Safety remains a primary focus, with risk assessments, training and staff engagement used on a continuous basis to foster a culture of safety compliance. Regular inspections and prompt repairs to laboratory and building equipment ensured a seamless environment for research activities throughout the year. Cost savings were delivered through regular reviews of procurement decisions, especially for laboratory consumables and scientific gases. Further responsibilities included chairing AWRI's Institutional Biosafety Committee, maintenance of Office of the Gene Technology Regulator accreditation, auditing and maintenance of Physical Containment Level 2 (PC2) laboratory facilities and administration of permits for a range of activities such as dangerous goods handling.

Corporate governance and legal support

AWRI's corporate governance and legal capability assists the effective functioning of the AWRI Board while providing legal support to all teams within the organisation and ensuring that AWRI continues to meet its legal obligations. During the year the AWRI Board welcomed two new Directors appointed via a rigorous recruitment process overseen by the AWRI Board Nominations Committee, and one new Director appointed to serve the remainder of a Levy Payer elected Director's term following the resignation of the incumbent. All Directors participated in comprehensive induction sessions prior to their first meeting to assist in preparation for their role. Other activities included maintaining good corporate governance processes in relation to risk management, which involved a revamp of the Strategic Risk Register to improve its effectiveness, general policy review and contract management.

Information technology and knowledge management

AWRI significantly changed its approach to delivering IT services during the course of the year by taking steps towards an outsourced managed services model. This approach will allow the organisation to access greater IT capacity and capability then it could otherwise deliver internally. The new model is expected to be embedded in the next financial year.

Marketing

AWRI's marketing capability provides expert marketing guidance to the organisation and is responsible for the development and execution of marketing strategies, campaigns, events and digital content. The 'It's your AWRI' campaign was launched on 1 December 2023 across various social and digital platforms with a goal of educating stakeholders about AWRI's role within the Australian wine industry and increasing awareness of the services offered. Between the launch of the campaign and 30 June 2024, 16,500 people were reached on social media, with a further 5,000 reached through other digital channels. In other marketing activity, Affinity Labs' courier vehicles were upgraded with custom-designed wraps, making them more visible on the road. The designs feature Affinity Labs' bright orange colour and brand marks, making them instantly recognisable as they collect samples from across South Australian and Murray Darling wine regions.

Affinity Labs

Background

Affinity Labs serves an important role in the Australian grape and wine industry, providing internationally recognised and accredited reference laboratory services, proof-of-performance testing, consulting services, microbiological and molecular analysis, grapevine virus testing and the design and implementation of trials for industry, covering all parts of the production chain from viticulture to packaged wine. Affinity Labs also continues to be actively involved in pre-competitively funded applied research projects and provides services to the broader agricultural industry and producers of other foods and beverages.

Analysis provided

Affinity Labs remains the Australian wine industry's leading provider of testing, technical support and consulting services. Ongoing efforts to streamline sample submission, analysis and reporting processes resulted in an improved customer experience, with 144 new clients over the financial year, the majority of these (96) from the grape and wine sector. Overall, sample numbers were 11% lower in 2023/24, with 19,823 samples submitted for routine, trace and microbiological analysis, compared with 22,339 in the previous year, reflecting the lower than average 2024 Australian harvest. Offsetting this decrease, there was an increase in trace analysis conducted on non-grape and wine samples. This diversity of work helps to maintain Affinity Labs' technical capabilities to support core wine industry clients.

Developing new capabilities

Affinity Labs continued to add new testing capability to its existing services. Due to changes in regulations for wines exported to the European Union (EU), energy values on labels of packaged wines are now mandatory and information on nutritional content and ingredients must be made available. As a result of this change, Affinity Labs now offers energy value calculations as standard on all EU export certificates and is actively supporting wine producers with provision of nutritional information. To complement this, a strategic partnership was put in place with e-label service provider (CellR), through which the nutritional and ingredient information can be made available to the consumer.

This year, grapevine varietal testing was made commercially available to industry, through a partnership with CSIRO, and this continues to attract interest from growers, producers and nurseries. Plans to commercialise a grapevine clonal identification service are underway, pending results of a Wine Australia impact project. Affinity Labs continued to build its testing capability in beer analysis, complementing the standard analytical services with more niche advanced analytical tests, including volatile compound profiling, yeast and bacterial spoilage identification and yeast vitality assessment. Testing for the problematic yeast diastaticus (a variant of *Saccharomyces cerevisiae*) was also made commercially available, to support craft brewers. This yeast can break down and ferment complex sugars left unfermented by traditional yeasts, leading to higher-than-expected alcohol content, compromised packaging due to secondary fermentation and off-flavours.

In spirits testing, a benchmarking study of gin products was completed, comparing the sensory and chemical composition of iconic Australian gins to market-leading global brands, with an emphasis on the classic London Dry style. This study provided valuable chemical data and sensory information to allow producers to understand stylistic differences and key compounds that influence gin aroma and flavour. An example of how 12 of the 19 gin products compared sensorially is shown in Figure 19.

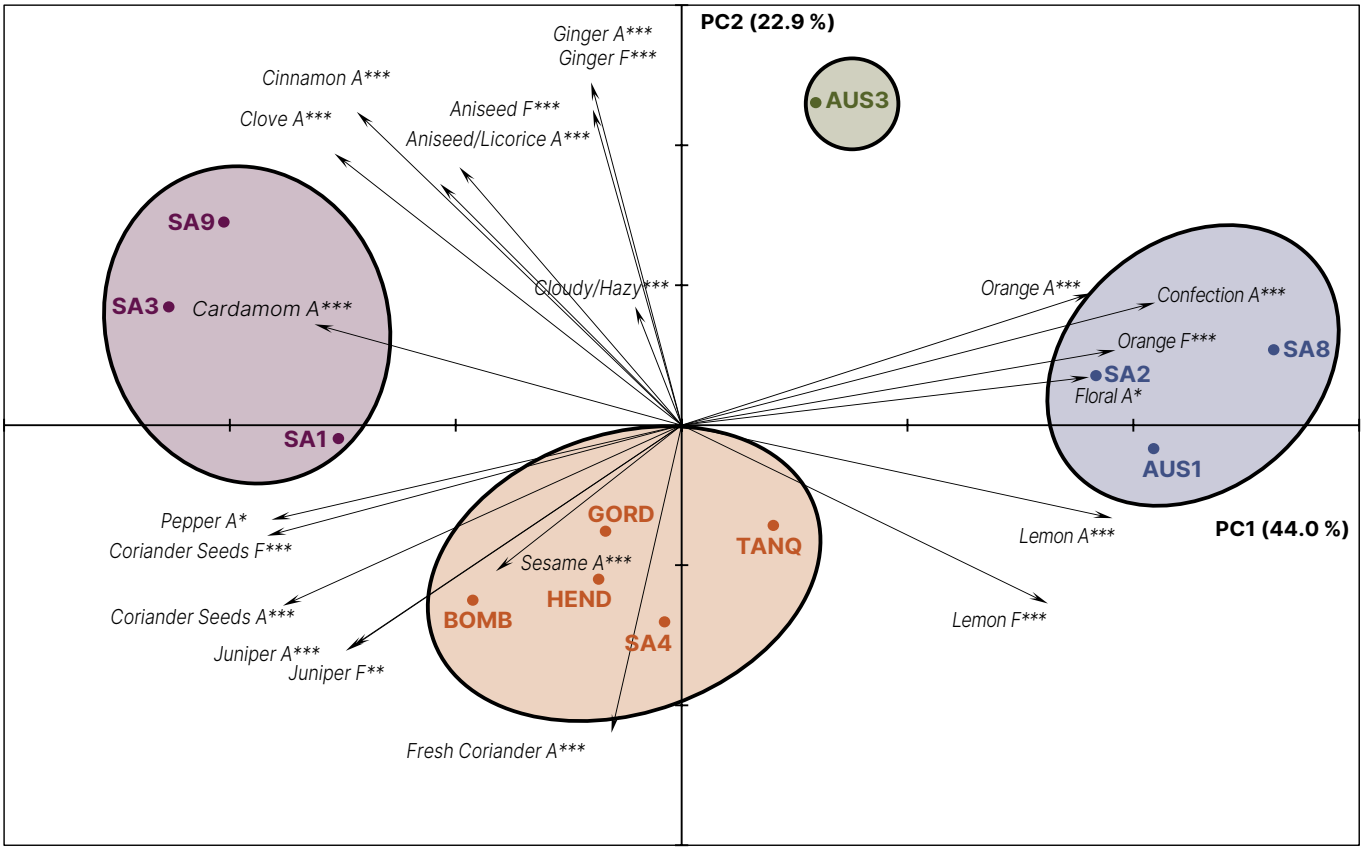

Figure 19. Clustering of commercial gin samples, according to significant aroma and flavour characteristics

Supporting regional producers

A big focus this year has been developing strategic partnerships to deliver advanced analytical services to wine regions with high volumes of commercial production. Affinity Labs launched a new facility in Merbein, Victoria, to support grape and wine industry clients in the Sunraysia region, as well as the broader needs of the horticulture sector for testing and diagnostic services. In the next year, it is anticipated that services offered from Merbein will be expanded to include maturity testing, grapevine trunk disease diagnostics and virus diagnostic testing for other horticultural crops. In addition, by partnering with local businesses, regular sample pick-up services have been set up in the Hunter Valley and Yarra Valley, as well as *ad hoc* pick-up services in Geelong and Mornington. Other regions have also expressed interest in this type of service.

Strengthening international partnerships for growth

Affinity Labs has continued to work closely with strategic partners in the UK and USA to exchange knowledge and broaden technical capabilities. This has allowed much faster implementation of new tests in the non-wine beverage and food sectors and provided access to advanced analytical capabilities that can support niche analytical requirements for producers, such as testing for perfluoroalkyl and polyfluoroalkyl substances (PFAS) and providing analytical tools for protecting the authenticity of bulk Australian wine shipments overseas. The partnership with Campden BRI is also working towards the launch of a new wine testing facility in the UK, bringing AWRI's almost 70 years of knowledge in wine testing and production to the rapidly growing UK wine industry.

Research services

Background

The provision of complex instrumentation, testing facilities and highly specialised analytical methods is a basic element of modern scientific research. This project ensures access to expertise such as sensory evaluation, grape and vineyard sourcing, organic synthesis and purification of rare compounds, statistical analysis and operation of advanced chemical analytical systems.

Sensory analysis

In the past 12 months there has been strong demand for sensory services, supporting research, industry and commercial clients. The external sensory panel completed 8 quantitative descriptive analysis studies, 15 rapid sensory evaluations and 28 smoke evaluation sessions, along with 16 training and calibration exercises. The technical quality panel undertook 31 sessions, evaluating more than 150 wines as a service to both industry and commercial clients. This work is essential for AWRI's helpdesk team, as the technical quality panel provides fast and reliable information that helps identify technical issues and informs remediation strategies. The internal difference testing panel also completed 14 evaluations, and the consumer panel was engaged for a further 2 studies. Our sensory panels also expanded their repertoire of products tested outside of wine this past year, undertaking evaluations of products including whiskey, gin, cheese, water, coffee and fruit.

Analytical chemistry support

Training was delivered to students and staff in sample preparation and the use of gas chromatography mass spectrometry (GCMS) and liquid chromatography mass spectrometry instruments. Management of the use of shared equipment and instruments is ongoing. Several GCMS methods for aroma compounds were developed or upgraded to increase robustness and cost-effectiveness.

AWRI wine microorganism culture collection

This year AWRI continued to support the distribution and safe storage of Australian wine microbiological germplasm through the AWRI wine microorganism culture collection. A total of 188 microorganisms were added to the collection, representing secure, long-term storage of research project outputs, and 60 microorganisms were distributed to internal and external parties.

WIC Winemaking Services

Background

Wine Innovation Cluster (WIC) Winemaking Services is based at the Hickinbotham Roseworthy Wine Science Laboratory and is a joint venture between AWRI and the University of Adelaide that was established in 2010. Its location within the University of Adelaide's purpose-built small-lot and pilot-scale winemaking facility enables the delivery of high-quality research and small-scale commercial winemaking services.

2024 vintage

WIC Winemaking Services had another very low research winemaking year in 2024. All the research trials conducted were generated from commercial clients, with none coming from Wine Australia-funded projects. In total, WIC Winemaking Services processed 45 research wines (6-100 kg), down from 57 in 2023, and received six parcels of trial wine made offsite for bottling preparation and packaging. A larger volume of commercial wine was made, with 12 batches (1-2 tonnes) during the 2024 vintage. The wines processed were 35% white (30% in 2023) and 65% red (70% in 2023). Total fruit intake was 18 tonnes, spread across 26 intake deliveries, down from 23 tonnes in 2023. Overall, while total ferment numbers were down significantly, total tonnage processed was bolstered by larger commercial-scale production clients.

A warmer start to the summer season saw a rapid onset of vintage, with the first fruit arriving on 15 February, a week earlier than 2023, and six parcels of fruit at the winery before the end of February. A heatwave in mid-March saw a slight pause in fruit intake, before the last fruit arrived on 11 April, three weeks earlier than 2023.

There will be another full off-season of agrochemical studies in the second half of the calendar year and ongoing NOLO project work, which will provide a steady stream of work to complement bottling operations. In the first year of operations for the NOLO trial-scale facility, 11 commercial clients and 2 research clients used the facility, accessing the SA Government's subsidy. From these 11 commercial clients, 27 potential new products were packaged for new product opportunities. Over the coming months, more research-based operations will be conducted using the spinning cone and reverse osmosis units to advance understanding of the flavour and mouthfeel of NOLO wines.

WIC Winemaking Services also delivered a range of non-wine-related beverage services during the year. In one project, the team worked with a family company from the Riverland on the production of a date liqueur using a combination of fresh and dried dates, as well as a date paste. The team also completed some initial trial work looking at blending, filtration and carbonation of an apple cider vinegar beverage to be packaged in 375 mL aluminium cans.

Metabolomics and bioinformatics service platforms

Background

AWRI established the South Australian node of Metabolomics Australia (Metabolomics SA) in 2008 as part of the national collaborative research infrastructure strategy (NCRIS) network with partners in WA, Victoria and Queensland, and funding provided by Bioplatforms Australia and the South Australian Government. Metabolomics SA operates as a collaborative service platform that provides public and private researchers and industries with support, services and training, as well as access to infrastructure and specialist expertise.

The Metabolomics SA team provided support through the following activities in 2023/24:

- Developing and deploying a new method for drug testing for clinical and pharmacokinetic veterinary studies
- Providing open, 'walk-up' access to mass spectrometry and nuclear magnetic resonance technology for more than 2,500 analyses
- Providing training to seven PhD students and three professional scientists in metabolomics sample handling and preparation, instrument operations and data analysis
- Performing intracellular lipidomics for clinical research
- Contributing to the Bioplatforms Framework Initiative – Plant Protein Atlas through non-targeted and targeted characterisation and lipidomics of faba beans
- Conducting mass spectrometry imaging of metabolites in a matrix of plant origin by partnering with UniSA-Proteomics Australia
- Collaborating with partners at CSIRO to assess the impact of PFAS on aquatic organisms using multi-omics
- Participating in a bioinformatics industry event and workshop for the Australian Bioinformatics and Computational Biology Society community.

An important outcome was the success of a LIEF grant application titled, 'An ion mobility-mass spectrometry based platform for structural proteomics' with key participants and funding co-contributors from the University of South Australia, Flinders University, AWRI, Metabolomics Australia, South Australian Health and Medical Research Institute and SA Pathology. This project will improve the imaging mass spectrometry capabilities in the state and provides unique opportunities for new translational activities in biomedical science, environmental science and agriculture, as well as upskilling of students and professional scientists.


AWRI
AWRI

Environmental, social and governance report

Background

AWRI is not a reporting entity for the purposes of Australian Sustainability Reporting Standards and accordingly is not required to comply with:

- AASB S1 General Requirements for Disclosure of Sustainability-related Financial Information
- AASB S2 Climate-related Disclosures

As such, AWRI does not intend to make any specific disclosures as part of its Financial Report. Nevertheless, AWRI is committed to operating sustainably and its environmental, social and governance (ESG) performance remains a key priority of the AWRI Board and management team. This report outlines AWRI's ESG approach and key activities for 2023/24.

Areas of focus

AWRI aims to demonstrate best practice through understanding, continually improving and reporting on environmental, social and governance aspects of our business. During the year the AWRI ESG Committee focused on:

- Assisting in the development of an ESG strategy
- Providing advice and direction on implementation of the ESG strategy; opportunities and risks to AWRI's operations and reputation; and corporate responsibility
- Working towards establishing, reviewing and reporting against a set of agreed ESG metrics and suggesting opportunities for improvement
- Supporting engagement with AWRI staff on ESG matters.

Environmental

In 2023/24, AWRI worked with Tandem Energy to develop an emissions reduction roadmap. This work was supported by an Assess-Implement-Monitor Grant from Green Industries SA, as part of its Business Sustainability Program 2022/23. The project involved three stages:

- Profiling – understanding AWRI's operations and developing an emissions inventory
- Possibilities – identifying and comparing opportunities for emissions reduction
- Pathways – illustrating potential scenarios and developing an action plan to demonstrate how AWRI can contribute to meaningful climate action by setting an ambitious yet achievable emissions reduction target.

The profiling stage involved calculation of a representative base year emissions inventory, primarily using data from 2021/22, with some travel data from 2019 to mitigate the effect of COVID-19. AWRI's emissions inventory totalled 1,644 t CO_2-e, with the highest sources of emissions related to electricity, professional services and purchased products. Based on the profiling, AWRI's Scope 1 emissions contributed 9.1%, Scope 2 emissions contributed 19% and Scope 3 emissions contributed 71.9% of the overall emissions.

A review of the main emissions sources and AWRI's operations resulted in a long list of emissions reduction opportunities. Following a workshop with AWRI staff, this led to a shortlist of opportunities, which were modelled to estimate potential emission reductions, costs and savings. This allowed direct comparison of all the opportunities in a marginal abatement cost curve. This analysis indicated that a low-emissions business travel policy and improving procurement practices were two opportunities with significant emissions reduction potential, without requiring significant financial outlay, and these will be discussed within the ESG committee.

The implementation of the identified opportunities over different timeframes (early, medium and late) was modelled to illustrate the varied emission reduction pathways AWRI could follow. These will further guide the ESG committee in developing metrics to monitor progress. The report highlighted that implementation of opportunities in the early and medium term would allow AWRI to reduce emissions in line with what is required globally to keep global temperatures below the threshold of 1.5°C above pre-industrial levels.

Social

The ESG committee has dedicated significant effort in understanding the metrics needed to support and monitor social policies that align with organisational values and ESG best practice. A particular focus this year has been on gender pay reporting. For the first time in February 2024, the Workplace Gender Equality Agency published the gender pay gaps of reporting entities. AWRI acknowledges that is has a significant gender pay gap and is committed to reducing that gap. In response, a gender action plan was established and an associated working group formed during the year to focus on gender equity within AWRI. Progress against the actions in the plan is reported annually to the AWRI Board.

AWRI has a diverse workforce, made up of almost 60% women, 20% of employees for whom English is a second language, 30% of employees who were born overseas and reasonably evenly split across age bands from ages 18 to 60. AWRI recognises that diversity of thought, background and experience lead to greater innovation, improved decision-making and stronger business performance. Our commitment to supporting diversity and inclusion throughout our workforce is now articulated in a Diversity and Inclusion Policy. This new policy references existing AWRI policies, which also support the organisation's commitment to providing an equitable workplace, free of bullying, harassment and discrimination.

Governance

AWRI models its governance framework on the Australian Institute of Company Directors' Not-for-Profit Governance Principles. With the release of the third edition of these principles in 2024, AWRI will review its framework to ensure it remains in alignment with the updated principles and to identify areas for improvement.

AWRI Financial statements

for the year ended 30 June 2024

Directors' report

The Directors present this report to the members of The Australian Wine Research Institute Limited (the Company) for the year ended 30 June 2024.

Overview of result

For the year ended 30 June 2024 the Company recorded a deficit of $2,113,996 (2023: deficit of $629,646). This deficit can primarily be attributed to (a) the application of a 'low vintage' funding reduction under the Company's Wine Australia Investment Agreement (circa $1.4m) and (b) delays and challenges with contracting projects. The Company also incurred one-off costs as a result of downsizing its work force ($484k) to align with structural changes in the wine industry, together with its current and anticipated future levels of funding.

Other material developments

Under its Investment Agreement with Wine Australia, there is a mechanism that allows for a proportional reduction in funding as a result of lower vintage volumes and consequently levies collected from wine-grape growers. On 17 May 2024 the Company was informed that it would be subject to a reduction (the second year in a row in which this has taken place) of circa $1.375m in its funding under the terms of its Investment Agreement with Wine Australia. This reduction would take effect in the financial year ending 30 June 2025. This funding reduction will have a material effect on the operations of the Company in the upcoming year; however, the Company's balance sheet remains strong and actions such as the downsizing of its workforce have been taken to mitigate this impact.

Events subsequent to reporting date

The Directors are not aware of any other matter or circumstance that has occurred since 30 June 2024 that has significantly affected or may significantly affect the operations of the organisation, the result of those operations or the state of affairs of the organisation in subsequent financial years.

Objective

The organisation's long-term objective is to support the Australian grape and wine industry through world-class research that results in practical solutions and the dissemination of knowledge and leading practices.

Principal activities

The Company's principal activities during the year were:

- **Research** activities that strive for scientific excellence and industry relevance
- **Development** activities that seek to bridge the gap between scientific discovery and value-adding technology or processes
- **Extension** activities that seek to disseminate research and development outcomes to facilitate rapid uptake by viticultural and winemaking practitioners
- **Commercial** services, delivered via its Affinity Labs brand, aimed at providing competitive specific and/or tailored solutions for individual entities across all industry sectors that leverage the other key activities of the AWRI.

Directors and Directors' meetings

The Board of the AWRI met six times during the year ended 30 June 2024. In addition, Directors attended Board strategy sessions and special purpose committee meetings during the year.

The following tables include:

- names of Directors holding office at any time during the financial year
- the number of scheduled and unscheduled Board and Board Committee meetings held during the financial year for which each Director was a member of the Board or relevant Board Committee and eligible to attend, and the number of meetings attended by each Director.

	Appointment date	Cessation date	Board meetings			
			A	B	C	D
Prof. Kiaran D. Kirk AM (Chair)	1 Jan 2017	–	4	4	2	2
Ms Trish R. Barry	1 Nov 2023	–	3	3	2	2
Mr Andrew J. Clarke	1 Jan 2023	12 Aug 2023	–	–	–	–
Hon Sarah J. Courtney	1 Nov 2022	–	4	4	2	2
Mr Wayne I. Ellis	1 Jan 2023	–	4	3	2	2
Ms Patricia Giannini	16 Sep 2020	–	4	4	2	2
Dr Mark P. Krstic	1 Feb 2020	–	4	4	2	2
Ms Carolyn J. MacDonald	1 Nov 2023	–	3	3	2	2
Mr Brett M. McClen	1 Jan 2022*	–	4	3	2	2
Ms Elizabeth A. Riley	1 Jan 2012	31 Oct 2023	1	1	–	–
Mr Damien J. Sheehan	1 Nov 2023	–	3	3	2	2
Mr T. Nigel Sneyd	1 Jan 2022	31 Dec 2023	2	2	–	–
Ms Corrina N. Wright	1 Jan 2022*	–	4	4	2	2

(A) SCHEDULED MEETINGS HELD (B) SCHEDULED MEETINGS ATTENDED
(C) UNSCHEDULED MEETINGS HELD (D) UNSCHEDULED MEETINGS ATTENDED

* Re-elected to a new term commencing 1 January 2024
Prof. Kirk was appointed Chair from 1 January 2023

Directors have been in office since the start of the financial year to the date of this report unless otherwise stated.

Out-of-cycle Board meetings are typically called for a special purpose that do not form part of the Board-approved yearly calendar.

	Committees							
	Audit		Personnel		Nomin-ations		Communi-cations & Marketing	
	H	A	H	A	H	A	H	A
Prof. Kiaran D. Kirk AM	–	–	1	1	–	–	–	–
Ms Trish R. Barry	–	–	–	–	–	–	5	5
Hon Sarah J. Courtney	3	3	–	–	–	–	5	5
Mr Wayne I. Ellis	–	–	1	1	–	–	–	–
Ms Patricia Giannini	3	3	–	–	–	–	–	–
Dr John Harvey	–	–	–	–	1	1	–	–
Ms Carolyn J. MacDonald	–	–	1	1	–	–	5	5
Mr Brett M. McClen	3	3	–	–	–	–	–	–
Ms Nikki Palun	–	–	–	–	1	1	–	–
Ms Elizabeth A. Riley	–	–	–	–	1	1	–	–
Ms Corrina N. Wright	–	–	–	–	1	1	–	–

(H) HELD (A) ATTENDED

Ms Giannini is the Chair of the Audit Committee.

Prof. Kirk is the Chair of the Personnel Committee.

Dr John Harvey was the Independent Chair of the Nominations Committee.

Ms Nikki Palun was an Independent Member of the Nominations Committee.

Ms Barry is the Chair of the Communications and Marketing Committee.

There was one unscheduled meeting for each of the Audit and Personnel Committees during the year.

Information on Directors

Details of Directors holding office during the course of the financial year, their qualifications, experience and any special responsibilities are set out below:

Prof. Kiaran D. Kirk AM Chair (Non-executive) from 1 January 2023
Qualifications BSc (Hons), PhD, DPhil
Experience Dean of the College of Science at the Australian National University (ANU), Chair of Clonakilla Wines. Previously Director of ANU Research School of Biology, Head of ANU Department of Biochemistry and Molecular Biology, and Research Fellow at University of Oxford. More than 28 years' experience in the Australian research sector with a publication record of more than 160 research papers in the field of biochemistry. Fellow of the Australian Academy of Health and Medical Science and Member of the Order of Australia.
Special Responsibilities Prof. Kirk is the Chair of the Personnel Committee.

Dr Mark P. Krstic Managing Director
Qualifications BAgSc (Hons), PhD, MBA, GAICD
Experience Chair of The Australian Wine Industry Technical Conference, Director of the National Wine Foundation, professional member of the ASVO, member of Horticulture Innovation's Table Grape Strategic Investment Advisory Panel, Co-Chair of the Wine Steering Committee, Associate Editor of the *Wine & Viticulture Journal*, member of the Wine Innovation Cluster Leadership Group and the Waite Strategic Leadership Group, member of Sustainable Winegrowing Australia Joint Steering Committee, member of OENOVITI and BAG Alliance Executive Committee, Honorary Senior Fellow at the University of Melbourne, Adjunct Professor at Macquarie University. Graduate of the Australian Wine Industry Future Leaders Program and 2020 ASVO Viticulturist of the Year.

Ms Trish R. Barry Non-executive Director
Qualifications B Bus (Hons), GradCert (Wine Mkt), GAICD
Experience An experienced marketing and communications professional with over 20 years of experience in the wine, tourism, hospitality, and financial service sectors. Trish is CEO and founder of Mastermind Consulting; a Wine Australia Future Leaders Alumni (2012); 2020 Wine Communicators of Australia Wine Communicator of the Year and Digital Communicator of the Year. Trish is actively involved in wine sector consulting to clients across Australia and New Zealand. She is a member of Wine Communicators of Australia,a former Wine Australia Future Leaders Coach and an industry advisor to the Royal Agricultural Society NSW Sydney Wine Show.
Special Responsibilities Ms Barry is the Chair of the Communications and Marketing Committee.

Mr Andrew J. Clarke Non-executive Director
Qualifications BViticOen, GAICD
Experience Viticultural advisor based in Bendigo Victoria, with 20+ years of experience across multiple regions and states in vineyard management and grape supply, including as chief viticulturist with Yering Station. Strong connections to the Agtech sector, grower community, research, government and industry bodies, combined with proven governance training and experience. President of the ASVO and previously on the Victorian Wine Ministerial Advisory Committee and the board of Vinehealth Australia. A Nuffield Scholar and a graduate of the Wine Australia Future Leaders program.

Hon Sarah J. Courtney Non-executive Director
Qualifications BE (Chem) (Hons), BCom (Finance), MWineTech, GAICD
Experience Owner of Fish Hook Wines in Tamar Valley. Served as a Minister in the Tasmanian Government, holding a number of senior portfolios including Primary Industries and Water, and Minister for Health during COVID-19. Was also the Shareholder Minister for several State-owned businesses, including Tasmanian Irrigation, TasTAFE and Tourism Tasmania. Currently Independent Chair of East 33, a vertically integrated Sydney Rock Oyster company.
Special Responsibilities Ms Courtney is a member of the Audit and Communications and Marketing Committee.

Mr Wayne I. Ellis Non-executive Director
Qualifications BApplMgt
Experience General Manager at Duxton Vineyards. Highly experienced operations leader with a background in operational and supply chain management spanning 26 years. Is responsible for the safe and sustainable management of more than 2,400 hectares of wine-grapes in the Murray Darling region in his current role, as well as Duxton's 80,000 tonne winery (previously Stanley Winery). Has extensive experience across a wide range of industry sectors including wine, project management, supply chain management and operational management in the electronics industry.
Special Responsibilities Mr Ellis is a member of the Personnel Committee.

Ms Patricia Giannini Non-executive Director
Qualifications BEc, GradDipAcc, CA
Experience An experienced CFO and commercial advisor with 25+ years experience working within large corporate entities and start-ups, public practice and advisory, and across finance and operations. Ms Giannini's experience includes KPMG audit, a facilitator and exam marker in Audit and Financial Reporting at the Institute of Chartered Accountants as well as a range of CFO, COO and commercial advisory roles including M&A, capital raising and business strategy spanning a wide range of sectors including technology, agriculture, food & beverage, manufacturing and mining.
Special Responsibilities Ms Giannini is the Chair of the Audit Committee.

Ms Carolyn J. MacDonald Non-executive Director
Qualifications BA (Journalism), GAICD
Experience Chief Operating Officer at Walter and Eliza Hall Institute of Medical Research (WEHI). Carolyn is an experienced senior executive with more than 15 years of leadership experience across the medical research, broadcasting and digital media industries. Carolyn is a board director (alternate) at Melbourne Genomics Health Alliance and is a Chapter Committee Member of AAMRI VIC (Australian Association of Medical Research Institutes).
Special Responsibilities Ms MacDonald is a member of the Personnel and Communications and Marketing Committees.

Mr Brett M. McClen Non-executive Director
Qualifications BAgSc (Hons), MBA
Experience Head of Viticulture & Sustainability at Brown Family Wine Group. More than 20 years' viticultural and management experience across a range of Australian wine regions, as well as experience working with other irrigated horticultural crops. Professional member and previously a director of the ASVO, finalist in the 2019 ASVO Viticulturist of the Year award.
Special Responsibilities Mr McClen is a member of the Audit Committee.

Ms Elizabeth A. Riley Non-executive Director
Qualifications BAppSc (Wine Sci), CertIV TAE, GAICD
Experience Managing Director and Viticulturist Vitibit Pty Ltd with 30 years' experience in the Australian wine industry. Nuffield Farming Scholar, professional member of the ASVO, corporate partner of the Hunter Valley Wine and Tourism Association (HVWTA), member of the HVWTA Wine Innovation Forum and member of the National Wine Biosecurity Committee. Previously an Executive member of the New South Wales Wine Industry Association and Chair of its Research and Development Committee. Formerly a Viticulturist with Southcorp Wines between 1993 and 1999 in national and NSW-based roles. 2017 ASVO Viticulturist of the Year, 2020 recipient NSW DPI Graham Gregory Award, 2022 Wine Magazine Viticulturist of the Year, 2023 Wine Communicators of Australia 'Legend of the Vine'.
Special Responsibilities Ms Riley was a member of the Nominations Committee.

Mr Damien J. Sheehan Non-executive Director
Qualifications BAppSc (Viticulture)
Experience General Manager and Viticulturist for Mount Langi Ghiran Winery in the Grampians region, Victoria. Current chair of the Grampians Wine Association, a previous chair of Wine Victoria and currently a member of the Technical Sub-committee of Wine Victoria. Over 30 years of experience in viticulture and actively involved in both regional and state associations over that time. Appointed to the Victorian Wine Ministerial Advisory Committee (2015-2019).

Mr T. Nigel Sneyd MW Non-executive Director
Qualifications BAppSc (Wine Sci), DipNat (Oenol), MBA, GAICD
Experience More than 40 years' domestic and international experience in the wine industry, including time spent with Brown Bothers Milawa, Hickinbotham Winemakers, Domaine Dujac, INRA, Champagne Krug, Evans & Tate, The Australian Wine Research Institute, BRL Hardy's Domaine de la Baume and Abbotts SARL, as well as 15 years with E. & J. Gallo based firstly in Europe and then in California, with exposure to winemaking in Italy, Spain, Germany, South Africa, California, Argentina and New Zealand. Most recently was Global Director of Wine, Quality and Compliance for Accolade Wines and now an independent consultant in the wine industry. Has been responsible for delivery of significant cross-functional projects in large-scale and boutique-scale wine production in diverse cultural settings.
Special Responsibilities Mr Sneyd was a member of the Personnel Committee.

Ms Corrina N. Wright Non-executive Director
Qualifications BCom, BAgSc (Oen), MAICD
Experience Owner and winemaker for Oliver's Taranga Vineyards, contract processing facility Oliver & Press Winemakers and owner of Swell Brewing Co. Advisory Board member of the Australian Women in Wine Awards and previously a director of the Winemakers' Federation of Australia and McLaren Vale Grape, Wine & Tourism Association. An active wine show judge and President of the Australian Alternative Varieties Wine Show. 2019 ASVO Winemaker of the Year.
Special Responsibilities Ms Wright is a member of the Nominations Committee.

Indemnification of officers and auditors

During the financial year, the Company paid a premium in respect of a contract insuring the Directors of the Company (named above), the Company Secretary, all members of the Company's Executive Management Group and members of the Biosafety Committee (a committee including two representatives who are not employees of the Company, charged with oversight of matters pertaining to the development and use of genetically modified organisms and required to be appropriately indemnified by the Office of the Gene Technology Regulator) against a liability incurred in their capacity as a director, secretary, executive or committee member to the extent permitted by the *Corporations Act 2001*. The contract of insurance prohibits disclosure of the nature of the liability and the amount of the premium.

The Company has not otherwise, during or since the end of the financial year, except to the extent permitted by law, indemnified or agreed to indemnify an officer or auditor of the Company or of any related body corporate against a liability incurred as such an officer or auditor.

Members' guarantee

In accordance with the Company's constitution, each member (both during the time he or she is a member and within one year afterwards) is liable to contribute $2 in the event that the Company is wound up. The total amount members would contribute is $20 (2023: $20).

Auditor's independence

The auditor's independence declaration as required under section 60-40 of the Australian Charities and Not-for-profits Commission (ACNC) Act 2012 is attached and forms part of the Directors' report for the financial year ended 30 June 2024.

Dated at Urrbrae on this the 17th day of September 2024.
This report is made in accordance with a resolution of the directors, pursuant to subsection 60.15(2) of the *Australian Charities and Not-for-profits Commission Regulation 2022*.

Kiaran D. Kirk
Chair

Mark P. Krstic
Managing Director

Declaration of independence

Declaration of independence by Josh Carver to the Directors of the Australian Wine Research Institute Limited.

As lead auditor of The Australian Wine Research Institute Limited for the year ended 30 June 2024, I declare that, to the best of my knowledge and belief, there have been:

1. No contraventions of the auditor independence requirements of section 60-40 of the *Australian Charities and Not-for-profits Commission Act 2012* in relation to the audit; and
2. No contraventions of any applicable code of professional conduct in relation to the audit.

Josh Carver
Director

BDO Audit Pty Ltd
Adelaide, 8 October 2024

Statement of profit or loss and other comprehensive income

For the year ended 30 June 2024

	Note	2024	2023
Revenue from operating activities			
Wine Australia			
Investment agreement project funding		5,569,967	6,715,061
Investment agreement capital funding		–	–
Other project funding		315,317	100,000
Other capital funding		–	–
Capital specific grant funding		17,241	788,516
Other grant funding		1,258,944	1,731,212
Commercial services analytical and consulting income		4,074,395	3,704,775
Contract research and other commercial income		2,509,845	2,135,648
Other revenue		631,208	806,234
Total revenue		14,376,917	15,981,446
Other income	*2*	(63,773)	–
Expenses from operating activities			
Personnel expenses	*3*	11,163,633	11,240,808
Analytical and project operating expenses		2,341,474	2,519,142
Infrastructure and general services expenses		1,629,329	1,607,883
Research funding contributions		610,149	340,879
Depreciation and amortisation expense	*8,9,10*	1,413,149	1,378,472
Travel expenses		284,300	410,040
Total expenses		17,442,034	17,497,224
Results from operating activities		(3,128,890)	(1,515,778)
Finance income		506,485	460,892
Profit/(loss) for the period		(2,622,405)	(1,054,886)
Other comprehensive income			
Items that will not be reclassified subsequently to profit or loss			
Gain/(loss) on revaluation of financial assets at fair value through other comprehensive income		508,409	425,240
Total comprehensive income for the period		(2,113,996)	(629,646)

The notes on pages 58 to 64 are an integral part of these financial statements.

Statement of changes in equity

For the year ended 30 June 2024

	Retained earnings	Co-investment reserve	Strategic IT investment reserve	Financial assets at fair value through OCI reserve	Total equity
Balance at 1 July 2022	14,496,109	621,396	–	510,515	15,628,020
Total comprehensive income for the period					
Profit or loss	(1,054,886)	–	–	–	(1,054,886)
Other comprehensive income					
Realised gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	–	–	–	297,074	297, 074
Unrealised gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	–	–	–	128,168	128,168
Total other comprehensive income	–	–	–	425,242	425,242
Total comprehensive income for the period	(1,054,886)	–	–	425,242	(629,644)
Transfers between retained earnings and other reserves					
Transfers to/(from) reserves	–	(80,000)	–	(297,073)	(377,073)
Transfers to/(from) retained earnings	377,073	–	–	–	377,073
Balance at 30 June 2023	13,818,296	541,396	–	638,684	14,998,376
Balance at 1 July 2023	13,818,296	541,396	–	638,684	14,998,376
Total comprehensive income for the period					
Profit or loss	(2,622,405)	–	–	–	(2,622,405)
Other comprehensive income					
Realised gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	–	–	–	24,377	24,377
Unrealised gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	–	–	–	484,032	484,032
Total other comprehensive income	–	–	–	508,409	508,409
Total comprehensive income for the period	(2,622,405)	–	–	508,409	(2,113,996)
Transfers between retained earnings and other reserves					
Transfers to/(from) reserves	–	(77,500)	–	–	(77,500)
Transfers to/(from) retained earnings	77,500	–	–	–	77,500
Balance at 30 June 2024	11,273,391	463,896	–	1,147,093	12,884,380

Nature and purpose of reserves

Co-investment reserve

The objective of the co-investment reserve is to provide funds for co-investment in specific funding opportunities, enabling the Company to access certain funding programs subject to the following requirements:

(i) That any co-investment be matched on at least an equal basis from externally sourced funds

(ii) That co-investments create value over the medium to long term for the ultimate benefit of the Australian grape and wine sector

(iii) That co-investments be made only in instances whereby the overall grant funds available to the Australian grape and wine sector are expanded - that is, excluding grant funding programs which already exist for the benefit of that industry.

Strategic IT investment reserve

The objective of the strategic information technology (IT) investment reserve is to ensure that sufficient funds are available for appropriate strategic investment in the Company's IT capabilities, consistent with relevant strategic plans as developed and amended from time to time, approved by the Board of Directors. Resourcing to meet the Company's day-to-day operational IT requirements, as distinct from its strategic IT requirements, is provided by other funding sources as identified within the statement of profit or loss and other comprehensive income.

Financial assets at fair value through Other Comprehensive Income (OCI) reserve

The reserve is used to recognise increments and decrements in the fair value of financial assets at fair value through Other Comprehensive Income.

The notes on pages 58 to 64 are an integral part of these financial statements.

Statement of financial position

As at 30 June 2024

	Note	2024	2023
Assets			
Cash and cash equivalents	*4*	987,558	1,227,200
Trade and other receivables	*5*	2,674,926	1,919,272
Inventories	*6*	74,492	74,336
Prepayments		347,887	436,493
Total current assets		4,084,863	3,657,301
Financial assets at fair value through OCI	*7*	10,463,957	9,029,070
Property, plant and equipment	*8*	3,036,959	4,052,969
Intangible assets	*9*	540,746	604,803
Right of use assets	*10*	2,939,090	3,132,584
Total non-current assets		16,980,752	16,819,426
Total assets		21,065,615	20,476,727
Liabilities			
Payables and accruals	*11*	2,254,229	1,972,405
Contract liability	*12*	3,946,967	1,330,763
Provisions	*13*	1,761,443	1,933,656
Total current liabilities		7,962,639	5,236,824
Payables and accruals	*11*	7,755	–
Provisions	*13*	210,841	241,527
Total non-current liabilities		218,596	241,527
Total liabilities		8,181,235	5,478,351
Net assets		12,884,380	14,998,376
Equity			
Retained earnings		11,273,391	13,818,296
Co-investment reserve		463,896	541,396
Strategic IT investment reserve		–	–
Fair value reserve		1,147,093	638,684
Total equity		12,884,380	14,998,376

The notes on pages 58 to 64 are an integral part of these financial statements.

Statement of cash flows

For the year ended 30 June 2024

	Note	2024	2023
Cash flows from operating activities			
Cash receipts from project grants and other income		16,385,417	12,853,742
Cash paid to suppliers and employees		(15,671,966)	(16,061,209)
Net cash from operating activities		713,451	(3,207,467)
Cash flows from investing activities			
Cash receipts from capital specific funding		(41,519)	734,661
Interest received		283,569	219,549
Dividends and imputation credits received		184,396	314,959
Proceeds from sale of property, plant and equipment		164,344	–
Acquisition of property, plant, equipment and intangibles		(580,586)	(1,426,525)
Receipts from leases		10,990	–
(Acquisition)/proceeds from disposal of financial assets		(932,554)	1,207,393
Payment of transaction costs related to financial investments		(41,732)	(46,371)
Net cash used in investing activities		(953,093)	1,003,666
Net increase/(decrease) in cash and cash equivalents		(239,642)	(2,203,801)
Cash and cash equivalents at 1 July		1,227,200	3,431,001
Cash and cash equivalents at 30 June	*4*	987,558	1,227,200

The notes on pages 58 to 64 are an integral part of these financial statements.

Notes to the financial statements

1. Material accounting policies

The Australian Wine Research Institute Limited (the "Company") is a company limited by guarantee, domiciled in Australia, incorporated under the *Corporations Act 2001*, registered as a charity under the *Australian Charities and Not-for-profits Commission Act 2012* (ACNC Act) and endorsed by the Australian Tax Office (ATO) as a Deductible Gift Recipient (DGR) organisation under the general DGR category of 'Approved Research Institute'.

The registered office of the Company and its principal place of business is:

Cnr Hartley Grove and Paratoo Road
Urrbrae, SA 5064

The financial statements were authorised for issue by the Board of Directors on the 17th day of September 2024.

Australian Accounting Standards set out accounting policies that the Australian Accounting Standards Board (AASB) has concluded would result in financial statements containing relevant and reliable information about transactions, events and conditions. Material accounting policies adopted in the preparation of these financial statements are presented below and have been applied consistently to all periods presented in these financial statements, and have been applied consistently by the Company.

Where necessary, comparative information has been reclassified to achieve consistency in disclosure with current financial year amounts and disclosures.

(a) Basis of preparation

(i) Statement of compliance

The financial statements of the Company are Tier 2 general purpose financial statements which have been prepared in accordance with the requirements of the *Australian Charities and Not-for-profits Commission Act 2012* and Regulation 2022, Australian Accounting Standards - Simplified Disclosures, Accounting Interpretations and other authoritative pronouncements of the AASB. The Company is a not-for-profit entity for financial reporting purposes under Australian Accounting Standards.

The Company is exempt from income tax under Section 50-5 of the *Income Tax Assessment Act 1997*, and accordingly no provision for income tax is included in these financial statements.

(ii) Basis of measurement

The financial statements, except for the cash flow information, have been prepared on an accruals basis and are based on historical costs except for some financial assets which are measured at fair value, and do not take into account changing money values.

(iii) Functional and presentation currency

The financial statements are presented in Australian dollars, which is the Company's functional currency.

The Company is of a kind referred to in ASIC Legislative Instrument 2016/191 dated 1 April 2016 and, in accordance with that Legislative Instrument, all financial information presented has been rounded to the nearest dollar unless otherwise stated.

(iv) Use of estimates and judgements

The preparation of financial statements in conformity with Australian Accounting Standards requires management to make judgements, estimates and assumptions that affect the application of accounting policies and the reported amount of assets, liabilities, income and expenses. The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances, the results of which form the basis of making judgements about the carrying value of assets and liabilities that are not readily apparent from other sources.

The estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised. The Company has identified the allowance for expected credit loss in respect of trade receivables (note 5), the useful lives of property, plant and equipment (note 8), amortisation period of intangible assets (note 9), right of use assets including its interest in the WIC Central building (note 10) and provisions for employee entitlements (note 13) and their respective note 1 accounting policies as areas under which significant judgements, estimates and assumptions are made, and where actual results may differ from those estimates under different assumptions and conditions.

(v) Changes in accounting policies

The Company has adopted all of the new or amended Accounting Standards and Interpretations issued by the Australian Accounting Standards Board ('AASB') that are mandatory for the current reporting period.

(b) Financial assets

Financial assets are initially measured at fair value. Transaction costs are included as part of the initial measurement, except for financial assets at fair value through profit or loss. Such assets are subsequently measured at either amortised cost or fair value depending on their classification. Classification is determined based on both the business model within which such assets are held and the contractual cash flow characteristics of the financial asset, unless an accounting mismatch is being avoided.

Financial assets are derecognised when the rights to receive cash flows have expired or have been transferred and the Company has transferred substantially all the risks and rewards of ownership. When there is no reasonable expectation of recovering part or all of a financial asset, its carrying value is written off.

Financial assets at fair value through profit or loss
Financial assets not measured at amortised cost or at fair value through other comprehensive income are classified as financial assets at fair value through profit or loss. Typically, such financial assets will be either: (i) held for trading, where they are acquired for the purpose of selling in the short-term with

an intention of making a profit, or a derivative; or (ii) designated as such upon initial recognition where permitted. Fair value movements are recognised in profit or loss.

Financial assets at fair value through other comprehensive income
Financial assets at fair value through other comprehensive income include equity investments which the Company intends to hold for the foreseeable future and has irrevocably elected to classify them as such upon initial recognition.

Impairment
The Company recognises a loss allowance for expected credit losses on financial assets which are either measured at amortised cost or fair value through other comprehensive income. The measurement of the loss allowance depends upon the Company's assessment at the end of each reporting period as to whether the financial instrument's credit risk has increased significantly since initial recognition, based on reasonable and supportable information that is available, without undue cost or effort to obtain.

Where there has not been a significant increase in exposure to credit risk since initial recognition, a 12-month expected credit loss allowance is estimated. This represents a portion of the asset's lifetime expected credit losses that is attributable to a default event that is possible within the next 12 months. Where a financial asset has become credit impaired or where it is determined that credit risk has increased significantly, the loss allowance is based on the asset's lifetime expected credit losses. The amount of expected credit loss recognised is measured on the basis of the probability weighted present value of anticipated cash shortfalls over the life of the instrument discounted at the original effective interest rate.

For financial assets measured at fair value through other comprehensive income, the loss allowance is recognised within other comprehensive income. In all other cases, the loss allowance is recognised in profit or loss.

(c) Property, plant and equipment

(i) Recognition and measurement

Items of property, plant and equipment are measured at cost less accumulated depreciation and accumulated impairment losses. Cost includes expenditure that is directly attributable to the acquisition of the asset, including borrowing costs directly attributable to the acquisition, construction or production of a qualifying asset. Cost also may include transfers from other comprehensive income of any gain or loss on qualifying cash flow hedges of foreign currency purchases of property, plant and equipment. Purchased software that is integral to the functionality of the related equipment is capitalised as part of that equipment.

When parts of an item of property, plant and equipment have different useful lives, they are accounted for as separate items (major components) of property, plant and equipment.

Gains and losses on disposal of an item of property, plant and equipment are determined by comparing the proceeds from disposal with the carrying amount of property, plant and equipment and are recognised net within other income in profit or loss.

(ii) Subsequent costs

The cost of replacing a part of an item of property, plant and equipment is recognised in the carrying amount of the item if it is probable that the future economic benefits embodied within the part will flow to the Company, and its cost can be measured reliably. The carrying amount of the replaced part is derecognised. The costs of the day to day servicing of property, plant and equipment are recognised in profit or loss as incurred.

(iii) Depreciation

Depreciation is calculated over the depreciable amount, which is the cost of an asset, or other amount substituted for cost, less its residual value.

Depreciation is recognised in profit or loss on a straight-line basis over the estimated useful lives of each part of an item of property, plant and equipment, since this most closely reflects the expected pattern of consumption of the future economic benefits embodied in the asset. Leased assets are depreciated over the shorter of the lease term and their useful lives unless it is reasonably certain that the Company will obtain ownership by the end of the lease term.

The estimated useful lives for the current and comparative periods are as follows:

- buildings and improvements 30 years
- plant and machinery 3 – 10 years
- office furniture and IT 3 – 10 years
- laboratory equipment 3 – 10 years

Depreciation methods, useful lives and residual values are reviewed at each financial year-end and adjusted if appropriate.

(d) Intangible assets

Intangible assets that are acquired by the Company and have finite useful lives are measured at cost less accumulated amortisation and accumulated impairment losses.

Amortisation is calculated over the cost of the asset, or another amount substituted for cost, less its residual value. Amortisation is recognised in profit or loss on a straight-line basis over the estimated useful lives of intangible assets from the date that they are available for use, since this most closely reflects the expected pattern of consumption of the future economic benefits embodied in the asset. Amortisation methods, useful lives and residual values are reviewed at each financial year-end and adjusted if appropriate.

(e) Right of use assets

A right of use asset is recognised at the commencement date of a lease. The right of use asset is measured at cost, which comprises the initial amount of the lease liability, adjusted for, as applicable, any lease payments made at or before the commencement date net of any lease incentives received, any initial direct costs incurred, and, except where included in the cost of inventories, an estimate of costs expected to be incurred for dismantling and removing the underlying asset, and restoring the site or asset. Right of use assets are depreciated on a straight-line basis over the unexpired period of the lease or the estimated useful life of the asset, whichever is the shorter. Where the Company expects to obtain ownership of the leased asset at the end of the lease term, the depreciation is over its estimated useful life. Right of use assets are subject to impairment or adjusted for any remeasurement of lease liabilities. The Company has elected not to recognise a right of use asset and corresponding lease liability for short-term leases with terms of 12 months or less and leases of low-value assets. Lease payments on these assets are expensed to profit or loss as incurred.

(f) Inventories

Inventories are measured at the lower of cost and net realisable value. The cost of inventories includes expenditure incurred in acquiring the inventories and other costs incurred in bringing them to their existing location and condition. Net realisable value is the estimated selling price in the ordinary course of business, less selling expenses.

(g) Impairment

The carrying amounts of the Company's non-financial assets are reviewed at each reporting date to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated.

The recoverable amount of an asset is the greater of its value in use and its fair value less costs to sell. Value in use is determined as the current replacement cost of an asset.

An impairment loss is recognised if the carrying amount of an asset exceeds its estimated recoverable amount. Impairment losses are recognised in profit or loss. Impairment losses recognised in prior periods are assessed at each reporting date for any indications that the loss has decreased or no longer exists. An impairment loss is reversed if there has been a change in the estimates used to determine the recoverable amount. An impairment loss is reversed only to the extent that would have been determined, net of depreciation or amortisation, if no impairment loss had been recognised.

(h) Employee benefits

(i) Other long-term employee benefits

The Company's net obligation in respect of long-term employee benefits is the amount of future benefit that employees have earned in return for their service in the current and prior periods plus related on-costs. The liability is measured such that it is not materially different from the estimate determined by discounting using market yields at the reporting date on corporate bonds with terms to maturity and currencies that match, as closely as possible, the estimated future cash outflows.

(ii) Termination benefits

Termination benefits are recognised as an expense when the Company is demonstrably committed, without realistic probability of withdrawal, to a formal detailed plan to either terminate employment before the normal retirement date, or to provide termination benefits as a result of an offer made to encourage voluntary redundancy. Termination benefits for voluntary redundancies are recognised as an expense if the Company has made an offer of voluntary redundancy, it is probable that the offer will be accepted, and the number of acceptances can be estimated reliably. If benefits are payable more than 12 months after the reporting period, then they are discounted to their present value.

(iii) Short-term benefits

Short-term employee benefit obligations are measured on an undiscounted basis and are expensed as the related service is provided. A liability is recognised for the amount expected to be paid under short-term bonus plans if the Company has a present legal or constructive obligation to pay this amount as a result of past service provided by the employee and the obligation can be measured reliably. Such liabilities represent the best estimate of the amounts required to settle the obligation at the end of the reporting period.

(i) Revenue recognition

The Company recognises revenue as follows:

(i) Revenue from contracts with customers

Revenue is recognised at an amount that reflects the consideration to which the Company is expected to be entitled in exchange for transferring goods or services to a customer. For each contract with a customer, the Company: identifies the contract with a customer; identifies the performance obligations in the contract; determines the transaction price which takes into account estimates of variable consideration and the time value of money; allocates the transaction price to the separate performance obligations on the basis of the relative stand-alone selling price of each distinct good or service to be delivered; and recognises revenue when or as each performance obligation is satisfied in a manner that depicts the transfer to the customer of the goods or services promised.

(ii) Donations

Donations are assessed to determine whether they carry sufficiently specific performance obligations and meet other criteria for recognition in accordance with AASB 15 Revenue from Contracts with Customers, where this is not the case donations are recognised on receipt in accordance with AASB 1058 *Income of Not-for-Profit Entities*.

(iii) Grants

Grant revenue is recognised in profit or loss when the Company satisfies the performance obligations stated within the funding agreements. If conditions are attached to the grant which must be satisfied before the Company is eligible to retain the contribution, the grant will be recognised in the statement of financial position as a liability until those conditions are satisfied. Where there are no sufficiently specific performance obligations, grant revenue is recognised in accordance AASB 1058 *Income of Not-for-Profit Entities*.

(iv) Finance income

Finance income comprises interest income and dividends. Interest income is recognised as it accrues in profit or loss using the effective interest rate method. Dividend income is recognised in profit or loss on the date on which the Company's right to receive payment is established.

(v) Other revenue

Other revenue is recognised when it is received or when the right to receive payment is established.

(j) Goods and services tax

Revenue, expenses and assets are recognised net of the amount of goods and services tax (GST), except where the amount of GST incurred is not recoverable from the taxation authority. In these circumstances, the GST is recognised as part of the cost of acquisition of the asset or as part of the expense.

Receivables and payables are stated with the amount of GST included. The net amount of GST recoverable from, or payable to, the ATO is included as a current asset or current liability in the statement of financial position.

Cash flows are included in the statement of cash flows on a gross basis. The GST components of the cash flows arising from investing and financing activities which are recoverable from, or payable to, the ATO are classified as operating cash flows.

(k) Trade and other receivables

Trade receivables are initially recognised at fair value and subsequently measured at amortised cost using the effective interest method, less any allowance for expected credit losses. Trade receivables are generally due for settlement within 30 days. The Company has applied the simplified approach to measuring expected credit losses, which uses a lifetime expected loss allowance. To measure the expected credit losses, trade receivables have been grouped based on days overdue. Other receivables are recognised at amortised cost, less any allowance for expected credit losses.

2. Other income

	2024	2023
Net gain/(loss) on sale of property, plant and equipment	(63,773)	–
	(63,773)	–

3. Personnel expenses

	2024	2023
Wages and salaries	9,788,920	9,806,053
Other associated personnel expenses	354,709	391,482
Contributions to defined contribution plans	1,020,004	1,043,273
	11,163,633	11,240,808

4. Cash and cash equivalents

	2024	2023
Cash on hand	313	237
Bank deposits at-call	987,245	1,226,963
Cash and cash equivalents in the statement of cash flows	987,558	1,227,200

5. Trade and other receivables

	2024	2023
Trade receivables due from those other than related parties	993,026	736,945
Trade receivables due from related parties	54	–
Other receivables	1,681,846	1,182,327
	2,674,926	1,919,272

Trade receivables are shown net of expected credit losses amounting to $30,417 (2023: $26,153) at reporting date. This allowance account is used to record expected credit losses until the Company is satisfied that no recovery of the amount owing is possible; at that point the amounts are considered irrecoverable and are written off against the financial asset directly.

6. Inventories

	2024	2023
Course materials on hand - wine	74,492	74,336
	74,492	74,336

7. Other investments

	2024	2024
Non-current		
Financial assets at fair value through OCI, comprising listed investments at fair value in:		
Interest rate securities	5,448,444	4,780,360
Equity securities	5,015,513	4,248,710
	10,463,957	9,029,070

All equity securities and interest rate securities are quoted on the Australian Securities Exchange. Interest rate securities include corporate bonds, subordinated notes and convertible and reset preference securities. Equity securities include direct shareholdings, exchange traded funds and managed funds.

8. Property, plant and equipment

	Plant and machinery	Office furniture and IT	Laboratory equipment	Total
Cost				
Balance at 1 July 2023	741,682	1,183,836	13,990,195	15,915,713
Additions	25,551	47,676	214,966	288,193
Transfers	–	–	9,335	9,335
Disposals	–	(16,708)	(424,032)	(440,740)
Balance at 30 June 2024	767,233	1,214,804	13,790,464	15,772,501
Depreciation and impairment losses				
Balance at 1 July 2023	617,399	949,777	10,295,568	11,862,744
Depreciation charge for the year	38,411	116,005	931,004	1,085,420
Transfers	–	–	–	–
Disposals	–	(16,708)	(195,914)	(212,622)
Balance at 30 June 2024	655,810	1,049,074	11,030,658	12,735,542
Carrying amounts				
at 1 July 2023	124,283	234,059	3,694,627	4,052,969
at 30 June 2024	111,423	165,730	2,759,806	3,036,959

9. Intangible assets

	Computer software	Intangible assets under development	Total
Cost			
Balance at 1 July 2023	1,200,201	208,272	1,408,473
Additions	31,607	31,500	63,107
Transfers	–	(9,335)	(9,335)
Disposals	(28,839)	–	(28,839)
Balance at 30 June 2024	1,202,969	230,437	1,433,406
Amortisation and impairment losses			
Balance at 1 July 2023	803,670	–	803,670
Amortisation charge for the year	117,829	–	117,829
Transfers	–	–	–
Disposals	(28,839)	–	(28,839)
Balance at 30 June 2024	892,660	–	892,660
Carrying amounts			
at 1 July 2023	396,531	208,272	604,803
at 30 June 2024	310,309	230,437	540,746

Computer software

Computer software assets are recognised as the attributable software licence and development costs paid to third parties, and do not include employee costs or an attribution of relevant overheads, as only an immaterial component of software development and testing processes are performed in-house. These software assets are amortised over periods of between three and five years, based upon their estimated useful lives and expected technical obsolescence.

Intangible assets under development at 30 June 2024 represent expenditure towards the development of computer software which as of that date is not classified as ready for use.

10. Right of use assets

	2024	2023
Buildings (WIC) – right of use		
Cost		
Balance at 1 July	6,100,140	6,100,140
Balance at 30 June	6,100,140	6,100,140
Depreciation and impairment losses		
Balance at 1 July	2,967,556	2,764,217
Depreciation charge for the year	203,339	203,339
Balance at 30 June	3,170,895	2,967,556
Carrying amount	2,929,245	3,132,584

	2024	2023
Equipment – right of use		
Cost		
Balance at 1 July	–	–
Recognition as right of use asset	16,408	–
Balance at 30 June	16,408	–
Depreciation and impairment losses		
Balance at 1 July	–	–
Depreciation charge for the year	6,563	–
Balance at 30 June	6,563	–
Carrying amount	9,845	–
Carrying amount of right of use assets	2,939,090	3,132,584

Interest in WIC building

The Company has a 50-year nominal occupancy right to approximately 53% of the space in the Wine Innovation Cluster (WIC) Central building owned by the University of Adelaide. The other occupants are currently the University of Adelaide and Fight Food Waste Cooperative Research Centre. The term of occupancy is reviewable after 30 years based on the remaining economic life of the building. The value assigned to the AWRI's interest in the building is net of amounts contributed by Wine Australia (WA). The building cost is being depreciated over a period of 30 years from the date of practical completion (26 November 2008).

11. Payables and accruals

	2024	2023
Current		
Trade payables due to those other than related parties	190,760	413,859
Trade payables due to related parties	–	–
Lease liability	3,235	–
PAYG and GST	369,295	346,877
Redundancy costs payable	315,738	–
Non-trade payables and accrued expenses	1,375,201	1,211,669
	2,254,229	1,972,405
Non-current		
Lease Liability	7,755	–
	7,755	–

12 Contract liability

Any unexpended WA funding is reimbursable to WA, except where WA agrees that amounts can be retained by the AWRI for purposes approved by WA, at which point such amounts are considered to be committed towards that purpose.

The unexpended investment agreement funds for the current year totalled $90,953 (2023: $37,643). During the year no unspent prior years' funds relating to WA projects were returned to WA (2023: NIL).

There were no unexpended funds from other WA contracts for the current year (2023: NIL).

	2024	2023
Unexpended funds carried forward to satisfy future performance obligations		
WA current year's investment agreement funding unexpended	90,953	37,643
WA current year's other contract funding unexpended	–	–
WA prior years' funding unexpended	70,988	248,662
	161,942	286,305
Income received in advance	3,785,025	1,044,458
	3,946,967	1,330,763

13. Provisions

	2024	2023
Current		
Employee entitlements	1,761,443	1,933,656
Non-current		
Employee entitlements	210,841	241,527
Number of employees (full-time equivalents)	96.1	103.5

14. Operating leases

Leases as lessee

Non-cancellable operating lease rentals are payable as follows:

	2024	2023
Within one year	3,432	3,432
One year or later and no later than five years	4,290	7,722
Later than five years	–	–
	7,722	11,154

The Company's operating leases are not considered to be material and the reported rental expenses are those at face value rather than as measured under AASB 16 Leases. These leases provide no option to renew or purchase at the completion of its term.

During the year ended 30 June 2024 an amount of $3,432 was recognised as an expense in respect of operating leases (2023: $3,432).

Leases as lessor

The Company leases out part of its interest in the WIC Central building (refer note 10) to the Australian Wine Industry Technical Conference Incorporated. Associated lease payments are included within the transactions with related parties disclosed within note 17. The future minimum lease payments under non-cancellable leases are receivable as follows:

14. Operating leases (cont)

	20243	2023
Within one year	8,000	8,000
One year or later and no later than five years	9,333	17,333
Later than five years	–	–
	17,333	25,333

During the year ended 30 June 2024 an amount of $10,045 was recognised as rental income (2023: $8,892). This amount exceeds the minimum lease payments disclosed above due to lease payments being subject to annual adjustment over the term of the lease with reference to an inflation-based index.

15. Capital commitments

	2024	2023
Property, plant and equipment *Contracted but not provided for and payable*		
Within one year	–	8,495
One year or later and no later than five years	–	–
Later than five years	–	–
	–	8,495
Computer software development *Contracted but not provided for and payable*		
Within one year	–	37,708
One year or later and no later than five years	–	–
Later than five years	–	–
	–	37,708

16. Research funding commitments

	2024	2023
Contracted but not provided for and payable		
Within one year	214,404	155,880
One year or later and no later than five years	214,404	208,426
Later than five years	–	–
	428,808	364,306

17. Related parties

Key management personnel compensation

Key management personnel comprises the Directors of the Company and other persons having authority and responsibility for planning, directing and controlling the activities of the Company. Key management personnel compensation comprised:

	2024	2023
Total remuneration	1,816,127	1,691,558

During the year non-executive Directors became entitled to compensation totalling $126,710 (2023: $91,569). A number of Directors voluntarily elected not to receive $61,000 of this entitlement (2023: $52,500), instead redirecting such amounts to support otherwise unfunded activities of the Company including individual and group professional development for AWRI staff, and the provision of support to visiting scientists.

Key management personnel and Director transactions

A number of key management personnel, or their related parties, hold positions in other entities that result in them having control or significant influence over the financial or operating policies of these entities.

A number of these entities transacted with the Company in the reporting period. The terms and conditions of the transactions with key management personnel and their related parties were no more favourable than those available, or which might reasonably be expected to be available, on similar transactions to non-key management personnel related entities on an arm's length basis.

Related parties arising through relationships with key management personnel:

Clonakilla Wines
Oliver & Press
Oliver's Taranga Vineyards
Mastermind Consulting
Vitibit Pty Ltd

Other related party transactions

During the year the Company provided administrative services and leased office premises to a jointly controlled entity, The Australian Wine Industry Technical Conference Incorporated.

Other related parties:
The Australian Wine Industry Technical Conference Incorporated

Transactions with related parties

	Transactions value for the year ended 30 June		Balance outstanding as at 30 June	
	2024	2023	2024	2023
Services received from related parties	18,322	3,741	–	–
Services provided to related parties	133,981	2,375	54	95

18. Auditor remuneration

During the year the following fees were paid or payable for services provided by accounting firm BDO Audit Pty Ltd, the auditor of the Company, and its network firms:

	2024	2023
Audit of the financial report	27,500	25,000
Other services:		
Preparation and lodgement of fringe benefits tax return	1,471	1,743
	28,971	26,743

19. Contingencies

In the opinion of the Directors, there were no material or significant contingent liabilities at 30 June 2024 (2023: NIL).

20. Subsequent events

There has not arisen in the interval between the end of the financial year and the date of this report any item, transaction or event of a material and unusual nature likely to significantly affect the operations of the Company, the results of those operations, or the state of affairs of the Company, in subsequent financial years.

It is noted that an amount of $315,738 was recognised as payable in relation to redundancy costs incurred or accrued prior to 30 June 2024 (refer to Note 11). These costs were subsequently paid in July 2024.

21. Limited liability

In accordance with the Company's constitution, each member (both during the time he or she is a member and within one year afterwards) is liable to contribute $2 in the event that the Company is wound up. The total amount members would contribute is $20 (2023: $20).

Responsible persons' declaration

The Directors of The Australian Wine Research Institute Limited (the Company) declare that, in the Directors' opinion:

(a) the financial statements, comprising the statement of profit or loss and other comprehensive income, statement of financial position, statement of cash flows, statement of changes in equity, and accompanying notes, are in accordance with the *Australian Charities and Not-for-profits Commission Act 2012* and:

  (i) comply with Australian Accounting Standards – Simplified Disclosures and the A*ustralian Charities and Not-for-profits Commission Regulation 2022*; and

  (ii) give a true and fair view of the entity's financial position as at 30 June 2024 and of its performance for the year ended on that date; and

(b) there are reasonable grounds to believe that the Company will be able to pay all of its debts, as and when they become due and payable.

Signed in accordance with subsection 60.15(2) of the *Australian Charities and Not-for-profits Commission Regulation 2022*.

Kiaran D. Kirk
Chair

Mark P. Krstic
Managing Director

Dated at Urrbrae on this the 17th day of September 2024.

Independent auditor's report to the members of The Australian Wine Research Institute Limited

Report on the Audit of the Financial Report

Opinion

We have audited the financial report of The Australian Wine Research Institute Limited (the registered entity), which comprises the statement of financial position as at 30 June 2024, the statement of profit or loss and other comprehensive income, the statement of changes in equity and the statement of cash flows for the year then ended, and notes to the financial report, including material accounting policy information, and the responsible entities' declaration.

In our opinion the accompanying financial report of The Australian Wine Research Institute Limited, is in accordance with Division 60 of the *Australian Charities and Not-for-profits Commission Act 2012*, including:

(i) Giving a true and fair view of the registered entity's financial position as at 30 June 2024 and of its financial performance for the year then ended; and

(ii) Complying with Australian Accounting Standards – Simplified Disclosures and Division 60 of the *Australian Charities and Not-for-profits Commission Regulations 2022*.

Basis for opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit* of the Financial Report section of our report. We are independent of the registered entity in accordance with the auditor independence requirements of the *Australian Charities and Not-for-profits Commission Act 2012* (ACNC Act) and the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (the Code) that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with the Code.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other information

The responsible entities of the registered entity are responsible for the other information. The other information obtained at the date of this auditor's report is information included in the registered entity's annual report, but does not include the financial report and our auditor's report thereon.

Our opinion on the financial report does not cover the other information and accordingly we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of responsible entities for the Financial Report

The responsible entities of the registered entity are responsible for the preparation and fair presentation of the financial report in accordance with Australian Accounting Standards – Simplified Disclosures and the ACNC Act, and for such internal control as the responsible entities determine is necessary to enable the preparation of the financial report that is free from material misstatement, whether due to fraud or error.

In preparing the financial report, responsible entities are responsible for assessing the registered entity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the responsible entities either intends to liquidate the registered entity or to cease operations, or has no realistic alternative but to do so.

The responsible entities of the registered entity are responsible for overseeing the registered entity's financial reporting process.

Auditor's responsibilities for the audit of the Financial Report

Our objectives are to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

A further description of our responsibilities for the audit of the financial report is located at the Auditing and Assurance Standards Board website (http://www.auasb.gov.au/Home.aspx) at: http://www.auasb.gov.au/auditors_responsibilities/ar4.pdf

BDO Audit Pty Ltd

Josh Carver
Director

Adelaide, 8 October 2024

Memorial funds

Consisting of (and collectively the "Trusts"):

The John Fornachon Memorial Library Endowment Fund

The Thomas Walter Hardy Memorial Trust Fund

The H. R. Haselgrove Memorial Trust Fund

The Stephen Hickinbotham Memorial Research Trust.

Statement by Directors of the trustee company

The Australian Wine Research Institute Limited (the "Trustee") acts as unrewarded trustee for the above listed Trusts. As detailed in note 2 to these financial statements, the Trusts are not reporting entities because, in the Trustee's opinion, it is unlikely that users exist who are unable to command the preparation of reports tailored so as to satisfy, specifically, all of their information needs. This is a special purpose financial report that has been prepared to meet the reporting obligations of the Trustee.

In the opinion of the Directors of The Australian Wine Research Institute Limited (the Trustee):

(a) (i) the statements of profit or loss and other comprehensive income give a true and fair view of each Trust's profit or loss for the year ended 30 June 2024; and

(ii) the statements of financial position give a true and fair view of each Trust's state of affairs as at 30 June 2024.

(b) at the date of this statement, there are reasonable grounds to believe that the Trusts will be able to pay their debts as and when they fall due.

This statement is made in accordance with a resolution of the Directors of the trustee company and is signed for and on behalf of the Directors by:

Kiaran D. Kirk

Chair

Dated at Urrbrae on this the 17th day of September 2024.

Notes to the financial statements

1. Nature and purpose of the Trusts

(a) The John Fornachon Memorial Library Endowment Fund was established on 30 September 1970, to provide for the establishment and maintenance of the Fornachon Memorial Library, for the promotion of study and general knowledge of the wine industry. The Fund was established by way of public appeal on a memorial to the late John Charles Macleod Fornachon, the Director of Research of The Australian Wine Research Institute Limited from 1955 to 1968.

(b) The Thomas Walter Hardy Memorial Trust Fund was established on 29 June 1993 to assist in the communication of information within the wine industry and associated activities, allied to the wine industry on behalf of the Trust. The Trust was established in memory of the late Thomas Walter Hardy.

(c) The H.R. Haselgrove Memorial Trust Fund was established on 12 December 1979 to provide for the promotion and encouragement of wine research by, or under the direction of, The Australian Wine Research Institute Limited as a memorial to the late Harry Ronald Haselgrove.

(d) The Stephen Hickinbotham Memorial Research Trust was established on 7 October 1986 to provide financial assistance and support in the pursuit of scientific research and associated activities, allied to the wine industry. The Trust was established in memory of the late Stephen John Hickinbotham. The Australian Wine Research Institute Limited assumed responsibility for the Trust on 25 May 1992.

2. Statement of accounting policies

In the opinion of the Trustee, the Trusts are of a type identified in Statement of Accounting Concepts 1 as non-reporting entities. Accordingly, the financial statements constitute 'special purpose financial reports' which have been prepared solely to meet the reporting obligations of the Trustee, and the limited information needs of the Trusts' members.

The financial statements have been prepared in accordance with accounting standards, except as stated below, and other mandatory professional reporting requirements.

The following accounting standards have not been adopted because, in the opinion of the Trustee, the cost of compliance outweighs the benefit of the resultant information:

- AASB 7 Financial Instruments: Disclosures
- AASB 107 Statement of Cash Flows
- AASB 124 Related Party Disclosures
- AASB 132 Financial Instruments: Presentation.

The financial statements have been prepared on an accrual basis.

Accounting policies have been consistently applied, with the only significant policy being in relation to investments.

Investments consist of interest rate securities and exchange traded funds, all of which are quoted on the Australian Securities Exchange and recorded at fair value through other comprehensive income. Investment income is brought to account as earned, with accrued earnings at balance date being included in the statement of financial position as receivables.

Statements of profit or loss and other comprehensive income

For the year ended 30 June 2024

	The John Fornachon Memorial Library Endowment Fund		The Thomas Walter Hardy Memorial Trust Fund		The H.R. Haselgrove Memorial Trust Fund		The Stephen Hickinbotham Memorial Research Trust	
	2024	**2023**	**2024**	**2023**	**2024**	**2023**	**2024**	**2023**
Income								
Investments	9,305	8,085	5,446	4,515	6,343	5,542	6,734	6,066
Donations and other income	–	–	–	–	–	–	–	–
Total income	9,305	8,085	5,446	4,515	6,343	5,542	6,734	6,066
Expenses								
Investment management expenses	720	513	522	419	575	434	595	462
Contribution to library assets	5,494	–	–	–	–	–	–	–
Total expenses	6,214	513	522	419	575	434	595	462
Profit/(loss) from ordinary activities	3,091	7,572	4,924	4,096	5,768	5,108	6,139	5,604
Other comprehensive income Items that will not be reclassified subsequently to profit or loss:								
Gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	4,822	5,374	2,291	3,564	3,347	3,823	3,672	4,320
Total comprehensive income for the period	7,913	12,946	7,215	7,660	9,115	8,931	9,811	9,924

Statements of financial position

As at 30 June 2024

	The John Fornachon Memorial Library Endowment Fund		The Thomas Walter Hardy Memorial Trust Fund		The H.R. Haselgrove Memorial Trust Fund		The Stephen Hickinbotham Memorial Research Trust	
	2024	**2023**	**2024**	**2023**	**2024**	**2023**	**2024**	**2023**
Assets								
Cash at bank	7,521	6,327	10,800	7,059	9,130	4,647	9,106	4,313
Investments	–	–	–	–	–	–	–	–
Receivables	4,153	2,240	2,163	970	2,811	1,514	3,035	1,677
Total current assets	11,674	8,567	12,963	8,029	11,941	6,161	12,141	5,990
Investments	153,739	148,933	85,245	82,965	106,235	102,900	113,669	110,009
Total non-current assets	153,739	148,933	85,245	82,965	106,235	102,900	113,669	110,009
Total assets	165,413	157,500	98,208	90,994	118,176	109,061	125,810	115,999
Liabilities								
Committed funding contribution	–	–	–	–	–	–	–	–
Total current liabilities	–	–	–	–	–	–	–	–
Net assets	165,413	157,500	98,208	90,994	118,176	109,061	125,810	115,999
Trust funds								
Settled sum	12,785	12,785	50	50	20,000	20,000	50	50
Founders donation	–	–	25,000	25,000	–	–	–	–
	12,785	12,785	25,050	25,050	20,000	20,000	50	50
Accumulated surplus								
Opening balance	136,196	129,107	58,523	56,819	83,382	78,605	109,241	104,011
Profit/(loss) for the year	3,091	7,572	4,924	4,096	5,768	5,108	6,139	5,604
Transfers to/(from) accumulated surplus	(369)	(483)	(239)	(2,392)	(271)	(332)	(281)	(373)
Closing balance	138,918	136,196	63,208	58,523	88,879	83,381	115,099	109,242
Financial assets at fair value through other comprehensive income reserve								
Opening balance	8,519	2,662	7,421	1,465	5,679	1,525	6,708	2,014
Gain/(loss) on revaluation of financial assets at fair value through other comprehensive income	4,822	5,374	2,290	3,564	3,347	3,823	3,672	4,320
Transfers to/(from) reserve	369	483	239	2,392	271	332	281	373
Closing balance	13,710	8,519	9,950	7,421	9,297	5,680	10,661	6,707
Total trust funds	165,413	157,500	98,208	90,994	118,176	109,061	125,810	115,999

APPENDIX 1

External presentations

Staff	Title of presentation	Presented to and where	Date
M.L. Longbottom	Sustainability: global insights	Sustainable Winegrowing Australia Granite Belt workshop, Stanthorpe, QLD	7 Jul 2023
	Regional targets: Rutherglen case study		
	Sustainability case studies		
P.J. Costello	MLF research round-up: applications and insights from current research at the AWRI	AWRI roadshow seminar, Barossa Valley, SA	
K.A. Bindon	Using maceration techniques to tailor red winemaking styles		
C.A. Varela	Is *Brettanomyces* able to evolve increasing sulfite tolerance?		
M. Essling	Trends in agrochemical use in the Barossa Valley		
	Scale and mealybug: what can you do to control these sap-sucking insects?		
	Basic principles of integrated pest management and the role of agrochemicals in causing pest problems		
C.M. Penfold	Weed management without synthetic chemicals		
T.E. Siebert	'Tropical' polyfunctional thiols and their role in Australian red wines	OenoMacrowine 2023, Bordeaux, France	12 Jul 2023
M.J. Herderich	Metabolomics and metabolite analysis for grape and wine research		
A.D. Coulter	Adapting to difficult (hot) vintages	North-east wine zone smoke decision toolbox, GoTafe, Wangaratta, VIC	14 Jul 2023
	Smoke taint: the latest research from the AWRI		
C.A. Simos	Preparing for smoke taint and where to access support activities		
A.M. Mierczynska-Vasilev	Applications of nanotechnology in the process of winemaking	Innovations in Food Science and Nutrition, Frankfurt, Germany	19 Jul 2023
P.J. Costello	Malolactic fermentation: opportunities and limitations	AWRI webinar	20 Jul 2023
A.D. Coulter, M. Parker	Smoke taint: the latest research from AWRI	Smoke taint workshop, Canberra District, ACT	25 Jul 2023
		Smoke taint workshop, Yarra Valley, VIC	26 Jul 2023
		Smoke taint workshop, Adelaide Hills, SA	27 Jul 2023
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Riverland, SA	1 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
C.M. Brodie	Internal audits		
L.M. Pitcher	Sustainability action planning and benchmarking reports		
C.M. Brodie	Biosecurity		
L.M. Pitcher	Pest and disease management in vineyards and winery chemicals		
C.M. Brodie	Land, soil and nutrient management		
L.M. Pitcher	Water and wastewater		
C.M. Brodie	Biodiversity		
	Waste		
	Air quality		
L.M. Pitcher	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
C.M. Brodie	Training and development		
	Suppliers		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Customer and regulatory requirements	AWISSP certification training, Riverland, SA	1 Aug 2023
C.M. Brodie	Incident management, corrective and preventative actions, management review		
L.M. Pitcher	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
M. Essling	Wine sector agrochemical requirements	Corteva New Zealand study tour, Urrbrae, SA	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Riverland, SA	2 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
C.M. Brodie	Internal audits		
L.M. Pitcher	Sustainability action planning and benchmarking reports		
C.M. Brodie	Biosecurity		
L.M. Pitcher	Pest and disease management in vineyards and winery chemicals		
C.M. Brodie	Land, soil and nutrient management		
L.M. Pitcher	Water and wastewater		
C.M. Brodie	Biodiversity		
	Waste		
	Air quality		
L.M. Pitcher	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
C.M. Brodie	Training and development		
	Suppliers		
L.M. Pitcher	Customer and regulatory requirements		
C.M. Brodie	Incident management, corrective and preventative actions, management review		
L.M. Pitcher	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
M. Essling	Agrochemical update	Farmer Johns Viticulture Technical Update, Nuriootpa, SA	
	Little pests, big problems	ASVO Seminar 'Maintaining established vineyards and establishing new vineyards' (virtual)	4 Aug 2023
M.J. Herderich	Metabolomics and metabolite analysis for grape and wine research and beyond	Researchers from the University of South Australia, Clinical and Health Sciences, Adelaide SA	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training (virtual)	8 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Property maps	AWISSP certification training (virtual)	8 Aug 2023
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		10 Aug 2023
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
M.L. Longbottom	Soil health, carbon and undervine management in a dry climate	AWRI webinar	
K.A. Bindon	New insights on the inhibition of potassium bitartrate crystallisation in wine	American Chemical Society Fall Symposium, San Francisco, USA	13 Aug 2023
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Swan Hill, VIC	15 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Incident management, corrective and preventative actions, management review	AWISSP certification training, Swan Hill, VIC	15 Aug 2023
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
B.H.C. Cordingley	Juice processing	United Nations International Trade Centre, Ukrainian winegrowers webinar series	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Mildura, VIC	16 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
	Sustainability: global insights and introduction		17 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Waste	AWISSP certification training, Mildura, VIC	17 Aug 2023
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
K.A. Bindon	New insights on the inhibition of potassium bitartrate crystallisation in wine	E. & J. Gallo Winery, Modesto, USA	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training (virtual)	21 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
G.D. Cowey	Fermentation 101	United Nations International Trade Centre, Ukrainian winegrowers webinar series	22 Aug 2023
L.M. Pitcher	Biosecurity	AWISSP certification training (virtual)	23 Aug 2023
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	24 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
	Sustainability: global insights and introduction	AWISSP certification training, Limestone Coast, SA	29 Aug 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Customer and regulatory requirements	AWISSP certification training, Limestone Coast, SA	29 Aug 2023
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
W.P. Pearson	McLaren Vale Districts projects results	McLaren Vale Grape Wine and Tourism Association members, McLaren Vale, SA	31 Aug 2023
M.L. Longbottom, L.M. Pitcher	Greenhouse gas emissions and more: digging about in Sustainable Winegrowing Australia data	AWRI webinar	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Riverland, SA	5 Sep 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
	Sustainability: global insights and introduction	AWISSP certification training, Barossa, SA	6 Sep 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		

Staff	Title of presentation	Presented to and where	Date
	Land, soil and nutrient management	AWISSP certification training, Barossa, SA	6 Sep 2023
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training (virtual)	11 Sep 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	12 Sep 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Documentation	AWISSP certification training, Urrbrae, SA	12 Sep 2023
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
	Biodiversity	AWISSP certification training (virtual)	14 Sep 2023
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
A.R. Borneman	Understanding *Brettanomyces* and its adaptation to control measures	AWRI webinar	21 Sep 2023
J.L. Hixson	Exploiting flavour precursors for improved white wine flavour		28 Sep 2023
M.J. Herderich	Distinctive flavour or taint? The case of smoky characters in wine, and beyond	Wartburg Symposium, Eisenach, Germany	5 Oct 2023
T.E. Siebert	Struck match: the chemistry and the winery experience	Aotearoa New Zealand Chardonnay Symposium, Hastings, New Zealand	
A.L. Robinson	Welcome and introduction to the AWRI	Advanced Viticulture Course (AVC 5)	16 Oct 2023
M.L. Longbottom	Sustainable Winegrowing Australia: your pathway to environmental stewardship, profitability and market access		
M. Essling	Meeting MRL requirements: a guide to understanding agrochemical use restrictions for market access		
A.R. Borneman	Understanding grapevine clonal diversity and identifying insect species through DNA sequencing		
R.B. Baaijens	Virus testing: enhancing management through knowledge		
M.G. Holdstock	Post-fermentation wine storage and management	United Nations International Trade Centre, Ukrainian winegrowers webinar series	17 Oct 2023
	Bottling and packaging: the pressure points		24 Oct 2023
K.A. Bindon	White wine texture	Wine Tasmania 6th Winemaker Symposium 'On the nose – aromatic whites', Launceston, TAS	25 Oct 2023

Staff	Title of presentation	Presented to and where	Date
A.L. Robinson	Welcome and introduction to the AWRI	Advanced Viticulture Course (AVC 6)	30 Oct 2023
M.L. Longbottom	Sustainable Winegrowing Australia: your pathway to environmental stewardship, profitability and market access		
M. Essling	Meeting MRL requirements: a guide to understanding agrochemical use restrictions for market access		
A.R. Borneman	Understanding grapevine clonal diversity and identifying insect species through DNA sequencing		
R.B. Baaijens	Virus testing: enhancing management through knowledge		
J.L. Hixson	Increasing wine flavour by foliar application of nitrogen and sulfur in the vineyard	Techniques for improving flavour in the vineyard and fermentation performance in the winery workshop, Limestone Coast, SA	2 Nov 2023
M.G. Holdstock	Case studies of foliar applications in 2023 and tasting of trial wines		
S.A. Schmidt	Nutrient requirement and management during fermentation		
	The beneficial style and performance effects of oxygen addition during fermentation		
C. Onetto	The relationship between grape juice composition and the progress of fermentation	Universitat Rovira i Virgili, Tarragona, Spain	5 Nov 2023
	The 1,000 grapevine genomes project: cataloguing Australia's grapevine germplasm	2nd International Congress on Grapevine and Wine Sciences Conference, La Rioja, Spain	8 Nov 2023
B.H.C. Cordingley	Analysing Interwinery Analysis Group samples: how order can impact your analysis	Interwinery Analysis Group Annual Seminar, Adelaide, SA	10 Nov 2023
J.L. Hixson	Increasing wine flavour by foliar application of nitrogen and sulfur in the vineyard	Techniques for improving flavour in the vineyard and fermentation performance in the winery workshop, Orange, NSW	14 Nov 2023
M.G. Holdstock	Case studies of foliar applications in 2023 and tasting of trial wines		
S.A. Schmidt	Nutrient requirement and management during fermentation		
	The beneficial style and performance effects of oxygen addition during fermentation		
J.L. Hixson	Increasing wine flavour by foliar application of nitrogen and sulfur in the vineyard	Techniques for improving flavour in the vineyard and fermentation performance in the winery workshop, Canberra District, ACT	15 Nov 2023
M.G. Holdstock	Case studies of foliar applications in 2023 and tasting of trial wines		
S.A. Schmidt	Nutrient requirement and management during fermentation		
	The beneficial style and performance effects of oxygen addition during fermentation		
V. Bellan	We gave them chocolate, what else can we do?	2023 Australia-Pacific Extension Network International Conference, Launceston, TAS	
A.R. Borneman	The use of non-*Saccharomyces* yeast in winemaking	AWRI webinar	16 Nov 2023
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	23 Nov 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Suppliers	AWISSP certification training, Urrbrae, SA	23 Nov 2023
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
M.L. Longbottom	Sustainability: global insights and introduction	AWISSP certification training (virtual)	27 Nov 2023
	Introduction to Sustainable Winegrowing Australia certification		
L.M. Pitcher	Property maps		
	Internal audits		
M.L. Longbottom	Sustainability action planning and benchmarking reports		
	Biosecurity		
L.M. Pitcher	Pest and disease management in vineyards and winery chemicals		
M.L. Longbottom	Land, soil and nutrient management		
L.M. Pitcher	Water and wastewater		
S.A. Schmidt	Uncovering the interplay between copper and SO_2 tolerance in *Saccharomyces cerevisiae*	International Specialised Symposium on Yeasts, Adelaide, SA	29 Nov 2023
J.R. Bellon	*Saccharomyces* interspecific hybridisation delivers evidence of hybrid heterosis in winemaking		
P.J. Costello	SO_2 production and early transient acetaldehyde production by *Saccharomyces cerevisiae*		
M.L. Longbottom	Biodiversity	AWISSP certification training (virtual)	30 Nov 2023
L.M. Pitcher	Waste		
	Air quality		
M.L. Longbottom	Energy and fuel		
	Scope and commitment to sustainability		
L.M. Pitcher	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
M.L. Longbottom	Incident management, corrective and preventative actions, management review		
L.M. Pitcher	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
M.L. Longbottom	Audit preparation and subsequent actions		
W. Jiang	Wine industry work experience	Nuriootpa High School students, Urrbrae, SA	5 Dec 2023
M. Parker	Supporting wine producers to manage smoke taint risk when assessing grapes	Waite Research Institute Showcase, Adelaide, SA	7 Dec 2023
C. Onetto	The 1,000 grapevine genomes project: cataloguing Australia's grapevine germplasm		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	11 Dec 2023
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
E.N. Wilkes	Data to help producers manage new EU labelling requirements	AWRI webinar	13 Dec 2023
R.T. Schlank	Irrigation scheduling	Drought resilience workshop, Stanthorpe, QLD	14 Dec 2023
E.N. Wilkes, M. Parker, R. Dixon, M.G. Holdstock	Smoke taint questions	Smoke taint Q&A session, Stanthorpe, QLD (virtual)	
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training (virtual)	22 Jan 2024
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		25 Jan 2024
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		

Staff	Title of presentation	Presented to and where	Date
S. Nordestgaard	Demonstration of tractor with autonomy kit	Australian Cabernet Symposium Agtech day, Coonawarra, SA	2 Feb 2024
M. Essling	Powdery and downy mildew control (including summary of regional spray data)	Wine Grape Council of South Australia GrowStrong Viti Fundamentals course, Langhorne Creek, SA	5 Feb 2024
R.B. Baaijens	Summary of viruses in Australian vineyards and testing services		
A.R. Borneman	Scale species update		
R.T. Schlank	Irrigation scheduling		
C.M. Penfold	Undervine cover crop selection, establishment and maintenance vineyard walk		
M.J. Herderich	Latest AWRI research	OIV student visit to AWRI, Urrbrae, SA	26 Feb 2024
M.L. Longbottom	Sustainable Winegrowing Australia		
	Industry Development and Support group capabilities		
M. Parker	A sensory journey from discovery to impact: AWRI and McLaren Vale	Southstart Festival Untethered, McLaren Vale, SA	7 Mar 2024
D. Espinase Nandorfy	Understanding perceptual interactions of wine flavour compounds: linking chemical composition and insights from physiology with sensory properties and consumer acceptance	CASS Food Research Centre, Deakin University, VIC	19 Mar 2024
		CSIRO Food Innovation Centre, Werribee, VIC	20 Mar 2024
M. Parker	Insights into wine research innovation, how SA scientists come up with research solutions to big picture issues	Clare Valley High School Agriculture students, Plant Genomics Centre, Urrbrae, SA	3 Apr 2024
		Eastern Fleurieu High School Agriculture students, Urrbrae, SA	9 Apr 2024
S. Nordestgaard	Autonomous vineyard vehicles from around the world	Society of Precision Agriculture Expo, McLaren Vale, SA	11 Apr 2024
	Autonomous vineyard vehicles – what's happening in Australia and around the world?	Future Ag Conference, Melbourne, VIC	18 Apr 2024
	Tractor decarbonisation	Marlborough Circular Wine Group, NZ (virtual)	1 May 2024
C.M Penfold	Non-chemical weed control	Wine Grape Council of SA, GrowStrong Viti Fundamentals course, Riverland, SA	
C.M. Brodie	McElroy solar farm case study		
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Mildura, VIC	
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Documentation	AWISSP certification training, Mildura, VIC	1 May 2024
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
	Sustainability: global insights and introduction		2 May 2024
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
G.D. Cowey	Welcome and introduction to the Advanced Wine Assessment Course	Advanced Wine Assessment Course (AWAC 59)	6 May 2024
B.H.C. Cordingley	Physiology of taste: recognition and description of wine flavours, taints and faults		
M.G. Holdstock	Palate performance and statistical evaluation		9 May 2024
	Welcome and introduction to the Advanced Wine Assessment Course	Advanced Wine Assessment Course (AWAC 60)	13 May 2024
B.H.C. Cordingley	Physiology of taste: recognition and description of wine flavours, taints and faults		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training (virtual)	13 May 2024
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
M. Parker	Savouring the sip... wine flavour, anosmias and saliva	Pint of Science, Wheatsheaf Hotel, Thebarton, SA	15 May 2024
D. Espinase Nandorfy	Understanding the occurrence, sensory properties and consumer acceptance of residual wine amino acids	Enoforum Zaragoza, Spain 2024 (virtual)	
G.D. Cowey	Palate performance and statistical evaluation	Advanced Wine Assessment Course (AWAC 60)	16 May 2024
	Biodiversity	AWISSP certification training (virtual)	
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	20 May 2024
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		

Staff	Title of presentation	Presented to and where	Date
L.M. Pitcher	Winery product identification, traceability, withdrawal and recall requirements	AWISSP certification training, Urrbrae, SA	20 May 2024
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
T.E. Siebert	Struck flint: the chemistry and the winery experience	AWRI webinar	30 May 2024
M.L. Longbottom	AWRI overview	Advanced Wine Technology Course (AWTC 2)	3 Jun 2024
G.D. Cowey	AWRI helpdesk		
A.R. Borneman	*Brettanomyces* and its adaptation to control measures		
M. Parker	From smoke-affected grapes to bottle-aged wines: managing risk of smoke taint with updated learnings from the 2020 experience		5 Jun 2024
W.P. Pearson	What's happening in no- and low- alcohol wine?		
F.T. Watson	Wine chemistry via NMR	3rd year chemistry undergraduate students, Western Sydney University (virtual)	6 Jun 2024
N.D.R. Lloyd	Metabolomics SA	Australian Bioinformatics and Computational Biology Society, Adelaide, SA	7 Jun 2024
L.M. Pitcher	Sustainability: global insights and introduction	AWISSP certification training, Urrbrae, SA	17 Jun 2024
	Introduction to Sustainable Winegrowing Australia certification		
	Property maps		
	Internal audits		
	Sustainability action planning and benchmarking reports		
	Biosecurity		
	Pest and disease management in vineyards and winery chemicals		
	Land, soil and nutrient management		
	Water and wastewater		
	Biodiversity		
	Waste		
	Air quality		
	Energy and fuel		
	Scope and commitment to sustainability		
	Documentation		
	Training and development		
	Suppliers		
	Customer and regulatory requirements		
	Incident management, corrective and preventative actions, management review		
	Winery product identification, traceability, withdrawal and recall requirements		
	Sustainable Winegrowing Australia trust mark use		
	Audit preparation and subsequent actions		
C.M. Penfold	Undervine weed control	Wine Grape Council of SA, GrowStrong Viti Fundamentals course, Limestone Coast, SA	18 Jun 2024
I.L. Francis	Integrating sensory evaluation in wine research: 35 years of evolution	American Society of Enology and Viticulture, 75th ASEV National Conference, Portland, USA	19 June 2024

Staff	Title of presentation	Presented to and where	Date
D. Espinase Nandorfy	Evidence-based approach to blending: how to target flavour and mouthfeel using proline and other measures	AVSO Oenology Seminar 'Achieving clarity getting wine into bottles', Wagga Wagga, NSW (virtual)	20 Jun 2024
G.D. Cowey	Wine heat and cold stability: a helpdesk perspective		
R.B. Baaijens	Virus testing: enhancing management through knowledge	SA Central Viticulture and Winemaking Symposium 'The Business of Shiraz, Growing, Making, Selling', Macclesfield, SA	25 Jun 2024
M. Parker	From smoke-affected grapes to bottle-aged wines: managing risk of smoke taint with updated learnings from the 2020 experience		
W.P. Pearson	Understanding regionality in Shiraz: sensory, chemical, and climate profiles of Shiraz wines from six Australian regions		26 Jun 2024
N. Scrimgeour	Benchmarking of London Dry style gins	Australian Distillers Association webinar	27 Jun 2024
N.D.R. Lloyd	Metabolomics SA	Australian Bioinformatics and Computational Biology Society Adelaide Bioinformatics Symposium 2024, Uraidla, SA	28 Jun 2024

APPENDIX 2

Events organised by AWRI staff

Staff	Title of event	Held	Date
M.G. Holdstock, P.J. Costello, K.A. Bindon, C.A. Varela, M. Essling, C.M. Penfold, B.H.C. Cordingley	AWRI roadshow seminar	Barossa Valley, SA	7 Jul 2023
M.L. Longbottom, F. Blefari, J. Scudds, M.F. Calabrese, W.G. McSorley	Sustainable Winegrowing Australia Granite Belt workshop	Stanthorpe, QLD	
A.D. Coulter, C.A. Simos	North-east wine zone smoke precision toolbox	Wangaratta, VIC	14 Jul 2023
A.D. Coulter, F. Blefari, J. Scudds, M.F. Calabrese, M. Parker, W.G. McSorley	Smoke taint workshop	Canberra District, ACT	25 Jul 2023
		Yarra Valley, VIC	26 Jul 2023
		Adelaide Hills, SA	27 Jul 2023
L.M. Pitcher, F. Blefari, J. Scudds, M.F. Calabrese, W.G. McSorley, M.L. Longbottom, C. Brodie	AWISSP certification training	Riverland, SA	1 Aug 2023
			2 Aug 2023
		Adelaide, SA (virtual)	8 Aug 2023
			10 Aug 2023
		Swan Hill, VIC	15 Aug 2023
		Mildura, VIC	16 Aug 2023
			17 Aug 2023
		Adelaide, SA (virtual)	21 Aug 2023
			23 Aug 2023
		Urrbrae, SA	24 Aug 2023
		Limestone Coast, SA	29 Aug 2023
		Riverland, SA	5 Sep 2023
		Barossa Valley, SA	6 Sep 2023
		Adelaide, SA (virtual)	11 Sep 2023
		Urrbrae, SA	12 Sep 2023
		Adelaide, SA (virtual)	14 Sep 2023

Staff	Title of event	Held	Date
M. Essling, M.F. Calabrese, R. Dixon, M.L. Longbottom, W.G. McSorley, A.R. Borneman, A.L. Robinson, J. Scudds, R.B. Baaijens	Advanced Viticulture Course (AVC 5)	Adelaide, SA	16-19 Oct 2023
	Advanced Viticulture Course (AVC 6)		30 Oct – 2 Nov 2023
J. Scudds, M.G. Holdstock, J.L. Hixson, S.A. Schmidt, V. Bellan	Techniques for improving flavour in the vineyard and fermentation performance in the winery workshop	Limestone Coast, SA	2 Nov 2023
		Orange, NSW	14 Nov 2023
		Canberra District, ACT	15 Nov 2023
L.M. Pitcher, M.L. Longbottom, W.G. McSorley	AWISSP certification training	Urrbrae, SA	23 Nov 2023
		Adelaide, SA (virtual)	27 Nov 2023
			30 Nov 2023
		Urrbrae, SA	11 Dec 2023
M.G. Holdstock, R. Dixon, M.L. Longbottom, R.T. Schlank, W.G. McSorley	Drought resilience workshop	Stanthorpe, QLD	14 Dec 2023
E. Wilkes, M. Parker, R. Dixon, M.G. Holdstock, W.G. McSorley,	Smoke taint Q&A session		
L.M. Pitcher, M.L. Longbottom, W.G. McSorley, J. Scudds, C.A. Rosales	AWISSP certification training	Adelaide, SA (virtual)	22 Jan 2024
			25 Jan 2024
C.A. Rosales, J. Scudds, M. Essling, M.L. Longbottom, R. Dixon, R.T. Schlank, W.G. McSorley	Wine Grape Council of South Australia GrowStrong Viti Fundamentals Course	Langhorne Creek, SA	5 Feb 2024
R.T. Schlank, V. Bellan	Irrigation management workshop for the Punjabi wine-grape growing community	Riverland, SA	30 April 2024
C.A. Rosales, J. Scudds, M. Essling, M.L. Longbottom, C.M. Penfold, C.M. Brodie, R.T. Schlank, W.G. McSorley	Wine Grape Council of South Australia GrowStrong Viti Fundamentals Course		1 May 2024
W.G McSorley, L.M. Pitcher, C.A. Rosales, J. Scudds	AWISSP certification training	Mildura, VIC	2 May 2024
B.H.C. Cordingley, C.A. Rosales, G.D. Cowey, J. Scudds, M.G. Holdstock, W.G. McSorley, D. Likos	Advanced Wine Assessment Course (AWAC 59)	Urrbrae, SA	6-9 May 2024
	Advanced Wine Assessment Course (AWAC 60)		13-16 May 2024
W.G. McSorley, C.A. Rosales, J. Scudds, L.M. Pitcher	AWISSP certification training	Adelaide, SA (virtual)	13 May 2024
			16 May 2024
		Urrbrae, SA	20 May 2024
W.G. McSorley, C.A. Rosales, J. Scudds, M.G. Holdstock, M.L. Longbottom, A.R. Borneman, J. Gledhill, J.L. Hixson, M. Parker, W.P. Pearson	Advanced Wine Technology Course (AWTC 2)	Adelaide, SA	3-6 Jun 2024
W.G. McSorley, C.A. Rosales, J. Scudds, L.M. Pitcher	AWISSP certification training Urrbrae, SA		17 Jun 2024
C.A. Rosales, J. Scudds, M. Essling, M.L. Longbottom, C.M. Penfold, R.T. Schlank, W.G. McSorley	Wine Grape Council of South Australia GrowStrong Viti Fundamentals Course	Limestone Coast, SA	18 Jun 2024

APPENDIX 3
Posters

Staff	Title of poster	Presented at	Date
S. Jalali[1], T. Bianco-Miotto[1], S. Sohrabi[1], N.D.R. Lloyd, R. Burton[1]	Inhibition of DNA methylation in *Cannabis sativa* by 5-azacytidine as a possible mechanism to manipulate secondary metabolites	Industrial Hemp Conference, Hunter Valley, NSW	15-19 Apr 2024
W. Jiang, J.A. Bellon, M.R. Solomon, L. Nicolotti, S.A. Schmidt, N.D.R. Lloyd	The development of a novel SPME-Arrow-GC-MS/MS method to profile volatile organic compounds in Gruner Veltliner wines produced from fermentation with hybrid yeasts	Metabolomics 2024, Osaka, Japan	16-20 Jun 2024

Affiliations of non-AWRI authors: [1]University of Adelaide

APPENDIX 4
Teaching responsibilities (lectures) of AWRI staff

Institution	Subject number	Subject name	No of lectures	Staff member
Flinders University	BTEC8008	Food bioprocessing	1	A.M. Mierczynska-Vasilev
University of Adelaide	3500WT	Grape and wine industry practice, policy and communication	1	S.A. Schmidt
			1	T.E. Siebert
			1	M.L. Longbottom
	7010WT	Stabilisation and clarification	3	A.D. Coulter
	7520WT	Advances in wine science	1	G.D. Cowey
	3046WT/7046WT	Fermentation technology III	1	J.L. Hixson
University of Queensland	CHEM2003	Food chemistry	1	D. Espinase Nandorfy

APPENDIX 5

Student supervision responsibilities of AWRI staff

Student	Supervisors	Source of funds
Honours		
Jayden Thomas-Revink	S.A. Schmidt, F. Whelan[1]	AWRI-University of Adelaide Collaborative Research Partnership Fund
Zhanshu Deng	K.A. Bindon, C. Ford[1]	
Bhavya Kulathunga	A. Yool[1], D. Espinase Nandorfy	
PhD		
Jana Hildebrandt	J.L. Hixson, I.L. Francis, M.J. Herderich, M.A. de Barros Lopes[2]	Wine Australia, Australian Government Research Training Program Scholarship
WenWen Jiang	K.L. Wilkinson[1], M. Parker, J. Mortimer[1]	Australian Academy of Technological Sciences & Engineering's Elevate scholarship, AWRI-University of Adelaide Collaborative Research Partnership Fund, University of Adelaide-Wine Australia scholarship
Ysadora Mirabelli-Montan	K.L. Wilkinson[1], M. Parker, D.W. Jeffery[1]	ARC Linkage grant, University of Adelaide
Shuyue Fan	D.W. Jeffery[1], K.A. Bindon	Adelaide University China Fee Scholarship, University of Adelaide Research Supplementary Scholarship, China Scholarship Council (CSC) Scholarship
Yiming Huo	K.L. Wilkinson[1], R. Muhlack[1], M.J. Herderich	CRC-P, University of Adelaide
Yanina Giordana	A.R. Borneman, P. Grbin[1]	ARC ITTC-2, University of Adelaide
Song Yan	K. Wilkinson[1], R. Muhlack[1], *M. Parker	ARC Linkage grant
Eleanor Bilogrevic	A. Corsi[1], R. Dolan[1], W.P. Pearson	CRC-P, Australian Vintage Ltd, University of Adelaide, AWRI, DrinkWise, S. Smith & Son Pty Ltd
Fei Zheng	R. David[1], C. Onetto, C. Ford[1], C. R. Lopez[3]	University of Adelaide
Matija Leskovic	W.J du Toit[4], M.Z. Bekker, J. Brand[4]	University of Stellenbosch
Flynn Watson	W.S. Price[5], A. Torres[5], M. Nilsson[6], M.J. Herderich, N.D.R. Lloyd	AWRI, Metabolomics Australia, Western Sydney University
Bryce Polley	K. Mengersen[7], K. Helmstedt[7], M.L. Longbottom, M. Mitchell[8]	Food Agility CRC, AWRI, QUT
Yu Hou	M.Z. Bekker, T.E. Siebert, D.W. Jeffery[1]	AWRI-University of Adelaide Collaborative Research Partnership Fund, University of Adelaide-Wine Australia scholarship
Stella Antony	S. Savocchia[9], R B. Baaijens, C.C. Steel[9], B.J. Stodart[9]	Australian Government Research Training Program Scholarship
Masters		
Tobias Hunscha	L. Nicolotti, M.J. Herderich	University of Hamburg
Berlia Roux	W.J. du Toit[4], M.Z. Bekker	University of Stellenbosch

Affiliations: [1]University of Adelaide, [2]University of South Australia, [3]University of Kentucky, [4]University of Stellenbosch, [5]Western Sydney University, [6]The University of Manchester, [7]QUT, [8]Food Agility CRC, [9]Charles Sturt University *Industry advisor

APPENDIX 6

Media interviews

Date	Staff member	Discussed	Media
9 Aug 2023	M.J. Herderich, M. Parker, M.P. Krstic	Smoke taint and climate change	Christina Pickard, *Wine Enthusiast*, USA
30 Aug 2023	J. Gledhill, W.P. Pearson	NOLO wine production and research	Dan Traucki, *WBM*
3 Oct 2023	M.G. Holdstock	Wine filtration	Andrew Smith, *Filtration and Separation magazine*
13 Oct 2023	S.A. Schmidt	Rose yeast	Jacquie van Santen, *Wine Australia R&I news*
16 Oct 2023	M. Parker	Smoke taint research since 2019/2020	
25 Oct 2023	M.G. Holdstock	Foliar spray practice change project and vintage trials	
15 Nov 2023	M. Parker	Smoke taint	Rockwell McGellin, *Elements podcast for Particle, Scitech's online science news site*
20 Nov 2023	M.L. Longbottom	Sustainable Winegrowing Australia	Kerrie Lush, *Riverland Wine podcast*
16 Jan 2024	M. Parker	Smoke taint	Michelle Aitken, *Particle, Scitech's online science news site*
17 Jan 2024	W.P. Pearson	Sensory implications of smoke taint	
15 Feb 2024	S. Nordestgaard	Capture of fermentation carbon dioxide	Jacquie van Santen, *Wine Australia R&I news*
21 Feb 2024	W. Jiang	Recent scholarship	Elsie Adamo, *SA Country Hour*
23 Feb 2024	A.D. Coulter	Does cling wrap get rid of cork taint?	Huon Hooke, *Sydney Morning Herald*
4 Mar 2024	S. Nordestgaard	Technological advances shaping the future of viticulture	Kate Calacouras, *The Weekly Times*
13 March 2024	M.P. Krstic	Importance of R&D for the wine sector	Eliza Spencer, *Guardian Australia*
15 Mar 2024	A. Mierczynska-Vasilev	Smart surfaces to remove unwanted sulfur compounds from wine	Jacquie van Santen, *Wine Australia R&I news*
3 Apr 2024	T.E. Siebert	Science of rotundone in wine	Amy Beth Wright, *SevenFifty Daily*
	W.P. Pearson	NOLO wines	Christopher Waters, *Globe & Mail*, Canada
6 May 2024	S. Nordestgaard	Autonomous tractors	Xavier Duff, *The Weekly Times*
17 May 2024	M.L. Longbottom	Sustainable Winegrowing Australia impact report	Cody Profaca, *Drinks Trade*
19 May 2024			Jillian Upton, *The Wine Show*
30 May 2024			Meg Brodtmann and Mel Gilcrist, *Wine with Meg + Mel*
7 Jun 2024	M. Parker	Smoke taint	Jeff Siegel, *Meininger's International*

APPENDIX 7

Papers published by AWRI staff recorded during 2023/2024

2369 Nordestgaard, S., Hsieh, D. 2023. Trialling autonomous under-vine weed management in Australian vineyards. *Aust. N.Z. Grapegrower Winemaker* (716): 40-45.

2370 Cordingley, B. 2023. Ask the AWRI: Gases – we have you covered. *Aust. N.Z. Grapegrower Winemaker* (716): 68-69.

2371 Bilogrevic, E., Jiang, WW., Culbert, J., Francis, L., Herderich, M., Parker, M. 2023. Consumer response to wine made from smoke-affected grapes. *Wine Vitic. J.* 38(4): 22-37.

2372 Cordingley, B., Coulter, A., Cowey, G., Dixon, R., Essling, M., Holdstock, M., Longbottom, M., Penfold, C., Pitcher, L., Schwarz, C., Simos, C., Krstic, M. 2023. Vintage 2023 – observations from the AWRI helpdesk. *Wine Vitic. J.* 38(4): 38-40.

2373 Dry, P. 2023. Savagnin. *Wine Vitic. J.* 38(4): p. 69.

2374 Wilkes, E., Hirlam, K., Scrimgeour, N. 2023. Alternative packaging and wine: Should we move beyond the green bottle? *Wine Vitic. J.* 38(4): 70-73.

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