Knowledge Development and Management from Topical Research and Development

FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **NWG 1102**

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Research Organisation: **National Wine and Grape Industry Centre**

Date: **April 2013**

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Abstract

Modules comprising PowerPoint presentations, fact sheets, technical notes and, in some cases, video animations were developed from Wine Growing Futures research outcomes. Topics included: the identification and management of non-botrytis bunch rots, light and white wine spoilage, trunk diseases, fruit splitting and micro-oxygenation of red wine. These modules are available on the National Wine & Grape Industry Centre (NWGIC) website (http://www.csu.edu.au/nwgic) and fit the format of modules on the GWRDC Innovators Network. The modules also formed the basis of four industry articles and nine articles across two editions of the Grape Vine Management Guide.

Fifteen Spring Vine Health Field Day (SVHFD) workshops were held over two consecutive seasons (2011/12 and 2012/13) in NSW, Victoria, South East Queensland, Western Australia and South Australia. Over 500 people from industry heard a range of experts present at these workshops. Topics, which were selected by regions, included: advanced pest and disease management, soil biology and managing the impacts of climate change. Preliminary evaluation showed that workshops increased topic knowledge, capability and engendered a desire to alter vineyard practices. However, an evaluation of practice change over a longer and more meaningful period of time was not possible within the project

1. Executive Summary

Spring Vine Health Field Day (SVHFD) workshops have been run in NSW for the past 4 seasons. The philosophy has been to run a regional workshop before the onset of each season to prepare the industry for the upcoming season. To ensure that the content of workshops is relevant to individual regions, the region is surveyed at the completion of the previous season's (SVHFD) and again prior to the season. Results of these surveys are then used by extension staff and regional representatives to develop the field day in conjunction with NWGIC research staff to ensure that existing networks are used to source the most relevant information and expertise nationally. Workshops have been extremely popular and well attended. Typical workshop programs can be found in the final reports (Appendix A1.1) along with the evaluation form used on the day to obtain feedback and to begin to plan for next season's field day.

Fifteen Spring Vine Health Field Day (SVHFD) workshops were held over two consecutive seasons (2011/12 and 2012/13) in the following regions:

- Riverina
- Hunter Valley
- Mornington Peninsula
- Granite Belt (SE QLD)
- Murrumbateman
- Limestone Coast
- Sunraysia
- Tumbarumba
- Mt Barker
- Margaret River
- Mudgee

Over 500 people from industry attended these workshops and heard experts present on a wide range of topics. Topics were selected by regions and included: advanced pest and disease management, soil biology and managing the impacts of climate change. A full list of topics can be found in Appendix A1.1

Field days were well attended and very popular. Preliminary evaluation (Appendix A1.1) showed that across the range of topics covered that there were significant increases in level of knowledge and capability and, in many cases, a desire to alter practices. The approach used to assess the workshops was KASA based, where the **K**nowledge, **A**ttitudes, **S**kills and **A**spirations of the participants was surveyed. Across 25 diverse topics **K**nowledge increased by an average of 32%. The topics were self selected by the regions, which in part explains the high value for **A**ttitude (importance) of 7.6 out of 10. **S**kills (knowledge levels and utilisation) increased by an average of 25% across the 25 topics. **A**spirations were articulated in hand written comments and allow one to determine, among other things, the likelihood of practice change and any resource or knowledge impediments to practice change.

An evaluation of practice change over a longer and more meaningful period of time was not possible within the project.

Modules were developed for key topical research and development issues arising from the Wine Growing Futures (WGF) Program exceeded the 4 modules initially proposed. Six fact sheets (Appendix A1.3), seven power point presentations (Appendix A1.4), four technical notes (Appendix A1.5) and four animations (Appendix A1.6) were developed by the project. This material was made available on the NWGIC website and has been forwarded to GWRDC. There are several other fact sheets, technical notes and power point presentations in draft form. In addition to this, these materials formed the basis for a series of industry articles (Appendix A1.8)

Modules formed the basis, along with other research conducted in WGF, for nine industry articles published in consecutive annual issues of the Grapevine management guide (Appendix A1.7). The Grapevine Management Guide is currently published by DPI NSW and distributed to every grape grower in NSW and made available widely outside NSW.

You tube-style animations were developed to support the extension modules. These animations have been extremely popular. Initial evaluations suggest that they are effective means to introduce a topic and simplify information to non specialists. However, they need to be used as starting point for where to source more detailed information. They are an effective way in which to promote NWGIC activities and GWRDC investments. NWGIC is exploring ways to make the production of these animations more cost effective.

Finally, the annual industry field day took place at NWGIC on 16th June 2011 with over 100 people attending. Attendees listened to presentations and took part in practical demonstrations and site tours (Appendix A1.9).

2. Introduction

In 2009, the National Wine and Grape Industry Centre (NWGIC) at Wagga Wagga commissioned an independent review of its research and extension capacity built under the Winegrowing Futures Program. The Review identified the strong extension capability of the NWGIC. This project aimed to use this extension capability to capture outcomes from a wide range of sources and deliver these widely to grape growers and winemakers.

To support ongoing development the Australian wine sector, at all stages in the value chain, from grape growing to wine sales, must remain internationally competitive and profitable. Research in Australia and overseas generates knowledge to address some of the most pressing technical issues for grape growers and winemakers. Knowledge generation in any field progressively undergoes scientific quality assurance through the peer-review publication process, Thus there is a continuous need to effectively package and disseminate and update this information as it is validated. This is a critical priority for industry. It is also critical to maximising the return on R&D investment

Current issues include grapevine heat stress, grapevine balance and hitting yield and quality targets, grape yield forecasting, water use efficiency, identifying consumer preferred wines, and grape flavour development for low alcohol wines,

This project was developed with consultation with the National representative of Australia's Small Winemakers and the NSW representative of Australia's major wine companies.

3. Project Aims and Performance Targets

Objectives of the project were to:

- Develop solutions to extend knowledge generated from a wide range of research sources. This will include modules comprising videos, Powerpoint presentations, technical notes and fact sheets
- Incorporate research outputs into the annual NWGIC National Grapevine Management Guide
- Incorporate research outputs into CSU education and training programs and align these with National competencies.
- Deliver 4 workshops, one for each research theme, in 3 NSW regions and 1 Victorian region
- Deliver 6 Spring Vine Health field days in key NSW regions (Riverina (x2), Orange, Hunter Valley, Tumbarumba, Mudgee) plus 2 more nationally (Yarra Valley, King Valley)
- Conduct an annual 'industry field day' at NWGIC Wagga Wagga in June 2011
- Investigate further options for using the NWGIC website to extend information nationally
- Facilitate activities relating to GWRDC's Regional grassroots program
- Develop training materials for GWRDC's Innovators Network as required

A further 6 months variation was successfully sought from GWRDC to deliver 8 more spring vine health workshops in the 2012/2013 season. Therefore an additional objective was added to the project:

- Deliver 4 Spring Vine Health field days in key NSW regions and deliver 4 Spring Vine Health field days in other states, viz. Victoria, Queensland, Western Australia and South Australia

Outputs the project aimed to deliver comprised:

<u>Year 1 (July 2011 to June 2012)</u>

1. Four modules on key topical research and development issues
2. A report on 8 Spring Vine Health field days in key NSW regions and 2 other workshops outside NSW
3. Annual industry field day at NWGIC
4. Three meetings of the National Wine Innovation and Extension Network
5. Improved annual Grapevine Management Guide
6. Four workshops in 3 key NSW regions and 1 Victorian region

<u>Year 2 (July 2012 to December 2012)</u>

7. Eight Spring Vine Health field days
8. Development of training materials for GWRDC's Innovators Network as required

4. Method

Project scientists and extension specialists worked with a scientific communicator to develop extension modules. Modules comprised PowerPoint presentations, fact sheets, technical notes and, in some cases, video animations. Topics were identified from the major outcomes from the Winegrowing Futures program and other topical issues aiming to complement, and not compete with, modules that have been developed for GWRDC's Innovators Network. This material formed the basis of a series of industry articles and was incorporated into consecutive issues of the annual NGWIC National Grapevine Management Guide

NGWIC took a key role in the coordination of national extension activities and resources through the continuing to chair the National Wine Innovation and Extension Network where:

- Issues of key importance to regions were explored.
- Inclusion of specialists in the field of practice change within the social sciences will allowed the group to address practice change related issues (e.g. barriers to adoption).

Fifteen Spring Vine Health Field Day (SVHFD) workshops were developed and run nationally. To ensure that the content of workshops was relevant to individual regions, the region was surveyed at the completion of the previous season's (SVHFD) and again prior to the season. Results of these surveys were then used by extension staff and regional representatives to develop the field day in conjunction with NWGIC research staff to ensure that existing networks were used to source the most relevant information and expertise nationally. Workshops were evaluated on the day (Appendix A1.2)

An annual industry field day took was delivered on 16th June 2011 and included topical presentations, practical demonstrations and site tours.

5. Results and Discussion

The materials developed for key topical research and development issues by the project exceeded the 4 modules proposed. Six fact sheets (Appendix A1.3), seven power point presentations (Appendix A1.4), four technical notes (Appendix A1.5) and four animations (Appendix A1.6) were developed by the project. This material was made available on the NWGIC website and has been forwarded to GWRDC. There are several other fact sheets, technical notes and power point presentations in draft form. In addition to this, these materials formed the basis for a series of industry articles (Appendix A1.8).

Capturing Outputs from the Wine Growing Futures Program

Wine Growing Futures Impact	NWG 1102 Output
Identified grape yield and quality reducing bunch rots, *Botryosphaeria*, *Greenaria* and *Colletotrichum* and demonstrated effective fungicides.	Fact sheet, PPT presentation, video
Confirmed the widespread distribution of Botryosphaeria canker of grapevine trunks and promoted remedial practices.	Fact sheet, PPT presentation, video
Discovered the cause of Young Vine Decline in the Riverina.	
Demonstrated the important impact of carbohydrate reserve dynamics on seasonal variation in grapevine yield.	.
Identified how heat stress impacts on grapevine physiological processes.	
Developed and used scintigraphy as a technique to improve our understanding of functional vascular connections in the grapevine.	
Demonstrated, using oxygen isotope studies, that berry age is a more reliable indicator of susceptibility to berry splitting than sugar 'maturity' (soluble solids concentration).	Fact sheet, PPT presentation, technical note
Developed a rapid PCR method for detection of ripe rots and bitter rots of grapes.	
Characterised the phylogenetic origins of bitter rot in Australia as a necessary first step elucidation of epidemiology and the development of management options.	
Identified flowering and overwintering as two critical control points for developing options to manage ripe rots and bitter rots in grapes.	Fact sheet, PPT presentation, video, technical note
Revealed unnecessary application of nitrogen and water.	
Demonstrated the extremely rapid passage of monovalent cations though and beyond the rootzone in a typical Riverina soil.	
Showed that incorporating spatial data, either soil conductivity surveys or visible-NIR remotely sensed canopy maps, into yield estimation can substantially reduce sampling requirements and, therefore, costs.	

Wine Growing Futures Impact	NWG 1102 Output
Showed that incorporating remotely sensed vineyard data from current and preceding seasons has the potential to significantly improve the skill of simple forecasting models.	
Identified consumer-preferred styles of Hunter Valley Semillon wines.	
Showed that substantially reducing yield in Riverina Semillon alone had no appreciable effect on wine quality. Instead winemaking practices, e.g. the use of different yeast, had noticeable effects on wine quality, as judged by consumers.	
Described links between consumer preferred wine styles for Hunter Valley Semillon and vineyard site characteristics and vineyard management.	
Showed that regional wine shows have the potential to be a vehicle to collect cost-effective and reliable consumer preference data.	
Discovered a link between taste preference and personality type that offers a solution to improve on traditional market segmentation approaches to consumer preference studies.	
Validated a small scale wine making protocol for white wine.	
Showed that post-harvest N additions generated different sensory attributes in wine compared with those wines made from different N-status plants.	
Demonstrated the benefits of microxygenation for red wine	Fact sheet, PPT presentation, video, technical note
Elucidated the effect of glass colour and thickness on aging white wine	Fact sheet, PPT presentation, video, technical note

The project facilitated the preparation of nine articles for the 2011-12 and 2012-13 'Grapevine Management Guide' (Appendix A1.7). The Guide was sent to all grape growers in NSW and distributed widely nationally. The subjects covered included:

- Soil warming and grapevine physiology
- Semillon water use
- Young vine decline
- Quality planting stock
- Organic matter in soils
- Managing root and wood nitrogen reserves
- Identifying and managing Bot canker
- Grapevine nematodes and their management
- Yield forecasting

You tube-style animations were developed to support the extension modules. These animations have been extremely popular. Initial evaluations suggest that they are effective means to introduce a topic and simplify information to non specialists. However, they need to be used as starting point for where to source more detailed information. They are an effective way in which to promote NWGIC activities and GWRDC investments. NWGIC is exploring ways to make the production of these animations more cost effective, e.g. by using media students at CSU.

The annual industry field day took place on 16th June 2011. Over 100 people attended. Attendees listened to presentations and took part in practical demonstrations and site tours. Details of speakers, content and activities can be found in Appendix A1.9. This milestone was brought forward to June 2011 with agreement from the GWRDC program manger at the time, Dr Troy Fischer.

Fifteen Spring Vine Health Field Day (SVHFD) workshops were held over two consecutive seasons (2011/12 and 2012/13) in the following regions (Appendix A1.1):

- Riverina
- Hunter Valley
- Mornington Peninsula
- Granite Belt (SE QLD)
- Murrumbateman
- Limestone Coast
- Sunraysia
- Tumbarumba
- Mt Barker
- Margaret River
- Mudgee

Over 500 people from industry attended these workshops and heard experts present on a wide range of topics. Topics were selected by regions and included: advanced pest and disease management, soil biology and managing the impacts of climate change. A full list of topics can be found in Appendix A1.1.

A 16th SVHFD was planned for Cowra in 2012. However, this field day was postponed in the week leading up to the event due to a lack of attendees.

Preliminary evaluation (Appendix A1.1) showed that across the range of topics covered that there were significant increases in level of knowledge and capability and, in any cases, a desire to alter practices. The approach used to assess the workshops was KASA where the **K**nowledge, **A**ttitudes, **S**kills and **A**spirations of the participants was surveyed. This well recognised approach determines whether the target audience is equipped to make targeted practice change. Across 25 diverse topics **K**nowledge increased by an average of 32%. Although the base level knowledge differed and the amount of increase varied, knowledge always increased (Appendix A1.1). The topics were self selected by the regions which in part explains the high value for **A**ttitude (importance) of 7.6 out of 10. **S**kills (knowledge levels and utilisation) increased by an average of 25% across the 25 topics. **A**spirations were articulated in hand written comments and allow one to determine, among other things, the likelihood of practice change and any resource of knowledge

impediments to practice change. None of the information collected provide any basis for modifying the SVHFD format.

An evaluation of practice change over a longer and more meaningful period of time was not possible within the project. The project has collected the initial KASA data along with detailed recording of topics email and contact details of participants. This provides an excellent opportunity to assess practice change in the longer term. This was not within the scope of the project but can be easily pursued if future resources become available.

The four NWGIC workshops were not conducted due to a perceived overload of workshops in most regions. Instead, NWGIC presenters and topics were included in SVHFD workshops (Appendix A1.1). These included:

- Soil biology and building-up carbon in soils (David Waters)
- Identification and management of common fruit rots (Tony Somers)
- Bacterial Inflorescence Rot (BIR): The story so far and the road ahead (Melanie Weckert)
- Irrigation and floor management (Shayne Hackett)
- Identification and management of bunch diseases (Chris Steel)
- Nutrition in the vineyard (Bruno Holzapfel)
- Identification and management of trunk diseases (Wayne Pitt)

6. Outcomes and Conclusions

Year 1	Ouput	Progress
1	Four modules on key topical research and development issues	Completed
2	A report on 8 Spring Vine Health field days in key NSW regions and 2 other workshops outside NSW	Completed
3	Annual industry field day at NWGIC	Completed
4	Three meetings of the National Wine Innovation and Extension Network	Completed
5	Improved annual Grapevine Management Guide	Completed
6	Four workshops in 3 key NSW regions and 1 Victorian region	NWGIC presentations were incorporated into SVHFD workshops

Year 2	Ouput	Progress
7	Eight Spring Vine Health field days	7 Completed, Cowra cancelled due to low attendance
8	Develop training materials for GWRDC's Innovators Network as required	Completed

7. Recommendations

The Spring Vine Health Field Day format was extremely popular in all regions. Although the initial evaluation was positive, a more complete evaluation of practice change over a longer period of time was not possible within the project. However, given that detailed records of attendees and topics were collected, a more complete evaluation is possible resources and this should be strongly considered. Feedback from many regions strongly supported a 'bookending' workshop at the end of the season to review the season and particularly what may have been learned in the region.

Initial feedback on the modules produced by the project has been positive and they complement materials on GWRDC's Innovators Network. The advantage of capturing this knowledge in a way that allows more widespread dissemination is powerful and needs to highlighted. However, this needs to be balanced against the desire for the regions to hear from the experts 'horses mouth' and will continue to be a subject of debate.

While the Grapevine Management Guide was an effective vehicle for communication of NWGIC and other research outcomes and activities, the future of the Guide is under review. The potential role of this NSW DPI project is being considered in a broader, national context by NWEIN (National Wine Extension and Innovators Network)

You tube-style animations developed were extremely popular and are an effective means to introduce a topic and simplify information to non specialists and promote NWGIC activities and the GWRDC. However, they need to be used as starting point for where to source more detailed information. Ways to make the production of these animations more cost effective need to be explored.

Appendix 1: Communication

A1.1. Spring Vine Health Field Day: reports

A1. 2. Spring Vine Health Field Day: evaluation forms

A1. 3. Fact Sheets

The following fact sheets can be accessed here:

http://www.csu.edu.au/nwgic/knowledge/publications

Fruit splitting
http://www.csu.edu.au/__data/assets/pdf_file/0003/393456/NWGIC-fs1-fruit-splitting.pdf

Trunk Diseases
http://www.csu.edu.au/__data/assets/pdf_file/0005/393458/NWGIC-fs2-trunkdiseases.pdf

Light Spoilage
http://www.csu.edu.au/__data/assets/pdf_file/0011/388937/NWGIC-fs3-light-spoilage.pdf

Botryosphaeria Dieback
http://www.csu.edu.au/__data/assets/pdf_file/0006/393459/NWGIC-fs4-botdieback.pdf

Micro Oxygenation
http://www.csu.edu.au/__data/assets/pdf_file/0012/388938/NWGIC-fs5-micro-oxygenation.pdf

Bunchrot
http://www.csu.edu.au/__data/assets/pdf_file/0012/388956/NWGIC-fs7-bunchrot.pdf

A1. 4. Power Point Presentations

Power Point Presentations were developed for:

- Fruit splitting
- Non botrytis bunch rots (x 2)
- Light and white wine spoilage
- Micro oxygenation of red wine
- Botryosphaeria canker (x 2)

A1. 5. Technical Notes

Technical Notes were developed for:

- Fruit splitting
- Non botrytis bunch rots
- Light and white wine spoilage
- Micro oxygenation of red wine

A1.6. Animations

The following animations can be accessed at the following http addresses

http://www.csu.edu.au/nwgic/knowledge

http://www.youtube.com/watch?v=-WnfPjwfIjw

http://www.youtube.com/watch?v=oqCpocJfsbk

http://www.youtube.com/watch?v=SMTbH6L1WrA

A1.7. Grapevine Management Guides

Project facilitated articles in the Grapevine Management Guide include:

Quality planting stock: it's your business (Helen Waite)
Young vine decline in the Riverina: a riddle solved (Melanie Weckert)
Soil warming before flowering increases grape flower numbers but decreases fruit set during sever photosynthetic stress (Suzy Rogiers *et al*.)
Semillon: a variety that can't hold its water (Suzy Rogiers *et al*.)
Increasing organic matter in the soil: a vineyard perspective (David Waters)
Influence of management practices on root and wood nitrogen reserves (Bruno Holzapfel and Jason Smith)
Identifying and managing bot canker (Sandra Savocchia and Wayne Pitt)

A1.7.1. Grapevine management Guide 2012-13

http://www.csu.edu.au/__data/assets/pdf_file/0008/419039/2012_2013-Grapevine-Management-Guide_high-res.pdf

A1.7.2. Grapevine management Guide 2011-12

http://www.csu.edu.au/nwgic/knowledge/publications

A1.8. Other Communication

Industry articles that were generated from the fact sheets and other project activities include:

Loothfar Rahman, Melanie Weckert, Greg Dunn. (2012) Floor management practices to reduce pest-nematodes in vineyards. *Australian and New Zealand Grapegrower & Winemaker*, February 2012

Andrew Clark (2012) The iron(III) tartrate photochemistry of wine: impacts of bottle colour and weight. *Australian and New Zealand Grapegrower & Winemaker*, October 2012

Wayne Pitt (2012) Symptoms and management of Bot Canker. *Australian and New Zealand Grapegrower & Winemaker*, December 2012

Chris Steel, Andrew Hall, David Waters (2013) Identification and management of non-Botrytis bunch rots. *Australian and New Zealand Grapegrower & Winemaker*, February 2013.

A1.9. Industry Showcase Day Program

WINEGROWING FUTURES & MORE

Thursday 16 JUNE 2011 @ the NWGIC training centre, Wagga Wagga, NSW

8.45 am Registration

9.15 am Opening and Welcome (**Mr David Lowe**, President, NSW Wine Industry Association)

9.30 am Grapevine Carbohydrate Balance: the foundation of viticulture (**Professor Jim Hardie)**

9.45 am Grapevine Carbohydrate Reserves: regional variation, soil temperature and management impacts (**Dr Jason Smith** / Dr Bruno Holzapfel / Dr Suzy Rogiers)

10.05 am Young Vine Decline: causal organisms, origin, remedies and carbohydrate relations (**Dr Melanie Weckert** / Dr Loothfar Rahman)

10.25 am Heat Stress: impacts on grapevine carbon relations and ripening, and remediation by shading and hydrocooling. **(Dr Dennis Greer** / Mark Weedon)

10.45 am Morning Tea and Poster Session

11.15 am Yield Prediction: Advances in 'On Ground' and 'Aerial Remote Sensing' improvements in on ground method and sampling efficiency. **(Associate Professor Greg Dunn** / **Dr Andrew Hall /** Dr Jason Smith / Dr Bruno Holzapfel)

11.35 am Consumer Preferred Wine Styles **(Associate Professor Anthony Saliba / Adjunct Professor Hildegarde Heymann / Mr John Blackman)**

12.00noon Lunch and Poster Session

1.00-2.20pm Interactive Group Sessions (40min each – choice of 2)

Interactive Group Sessions cont. (40min each – choice of 2)

Session 1: Pest and Disease Recognition:

Diseased propagating and planting material and

Bacterial Inflorescence Rot. **Dr Melanie Weckert**

Bunch rots. **A/Prof Chris Steel, Nicola Wunderlich**

Trunk rots. **Dr Sandra Savocchia, Dr Wayne Pitt**

Session 2: Wine Technology Tasting

Microxygenation. **Leigh Schmidtke**

Headspace oxygen. **Dr Andrew Clark**

Alcoholic strength. **Dr Peter Torley**

Nitrogen nutrition. **Markus Muller**

Session 3: NWGIC Facilities Tour

Topical Presentations

2.20pm Climate Change & Impacts on NSW Regions: (**Dr Andrew Hall)**

2.35 pm A Grassroots look at Vineyard Management Strategies that Worked in 2010-11 (**Mr Shayne Hackett /** Richard Hilder / Duncan Farquhar / Regional Extension Officers)

2.55 pm Grapevine Insights: new ways of seeing how grapevines work

Toward a functional grapevine model: (**Dr Inigo Auzmendi)**

Images inside the grapevine related to splitting, heat stress, sectorial flow of water and nutrients. (**Dr Simon Clarke /** Dr Suzy Rogiers)

3.15 pm Afternoon Tea

4.00 pm A Balanced Vineyard System: the foundation of a sustainable wine industry (**Professor Robyn Wood)**

4.20 pm Looking Forward

NSW Wine Industry Viewpoint

4.30pm Today's Message in Bottle (**Dr Jacqui Watt)**

4.40 pm Close

5.00 pm Refreshments

6.00 pm BBQ

Appendix 2: Intellectual Property

Not applicable

Appendix 3: References

Clark, A.C., Dias, D.A., Smith, T.A., Ghiggino, K.P. and Scollary, G.R. (2011). Iron(III) tartrate as a potential precursor of light-induced oxidative degradation of white wine: studies in a model wine system. *Journal of Agricultural and Food Chemistry* **59**: 3575–3581.

Clarke, S.J., Rogiers, S.Y. and Hackett, S. (2009). The frustration of fruit splitting. *The Australian and New Zealand Grapegrower and Winemaker* **542**: 37–39.

Clarke, S.J., Hardie, W.J. and Rogiers, S.Y. (2010). Changes in susceptibility of grape berries to splitting are related to impaired osmotic water uptake associated with losses in cell vitality. *Australian Journal of Grape and Wine Research* **16**: 469–476.

Greer, L.A., Harper, J.D.I., Savocchia, S., Samuelian, S.K. and Steel, C.C. (2011). Ripe rot of south-eastern Australian wine grapes is caused by two species of Colletotrichum: *C. acutatum* and *C. gloeosporioides* with differences in infection and fungicide sensitivity. *Australian Journal of Grape and Wine Research* **17**: 123–128.

Pitt, W.M., Huang, R., Savocchia, S. and Steel, C.C. (2010). Identification and distribution of *Botryosphaeria* spp. Associated with grapevine decline in New South Wales and South Australia. *Australian Journal of Grape and Wine Research* **16**: 258–271.

Pitt, W.M., Huang, R., Trouillas, F.P., Steel, C.C. and Savocchia, S. (2010). Evidence that Eutypa lata and other diatrypaceous species occur in New South Wales vineyards. *Australasian Plant Pathology* **39**: 97–106.

Pitt, W.M., Sosnowski, M.R., Huang, R., Qiu, Y., Steel, C.C. and Savocchia, S. (2012). Evaluation of fungicides for the management of Botryosphaeria canker of grapevines. *Plant Disease* (In Press, http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-11-11-0998-R).

Samuelian, S.K., Greer, L.A. Savocchia, S. and Steel, C.C. (2012). Overwintering and presence of *Colletotrichum acutatum* (ripe rot) on mummified bunches, dormant wood, developing tissues and mature berries of *Vitis vinifera*. *Vitis* **51**: 33–37.

Schmidtke, L.M., Clark, A.C. and Scollary, G.R. (2011). Micro-oxygenation of red wine: techniques, applications and outcomes. *Critical Reviews in Food Science and Nutrition* **51**: 115–131.

Steel, C.C., Greer, L.A. and Savocchia, S. (2012). Grapevine inflorescences are susceptible to the bunch rot pathogens, *Greeneria uvicola* (bitter rot) and *Colletotrichum acutatum* (ripe rot). *European Journal of Plant Pathology* **133**: 773–778.

Wunderlich, N., Ash, G.J., Steel, C.C., Raman, H. and Savocchia, S. (2011) Association of Botryosphaeriaceae grapevine trunk disease fungi with the reproductive structures of *Vitis vinifera*. *Vitis* **50**: 89–96.

Appendix 4: Staff

Associate Professor Gregory Dunn
Shane Hackett
Tony Sommers
Gregory Moulds
Jason Cappello
Kevin Dodds
Dr Wayne Pitt
Dr Suzy Rogiers
Dr Andrew Clark
Dr Melanie Weckert
Professor Chris Steel
Dr Sandra Savocchia
Dr Simon Clarke
Dr Leigh Schmidtke
Helen Waite
David Waters (Communications Officer)
Lara Smart (Administrative support for Spring Vine Health Field Days)
Robyn Cheesley (Administrative support for Spring Vine Health Field Days)