Travel to IX International Symposium on Grapevine Physiology and Biotechnology 2013



FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

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Principal Investigator: **Dr Marisa Collins**

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AUTHOR:

Dr. Marisa Collins*

SUPERVISORS:

Dr. Everard Edwards

Dr. Rob Walker

Dr. Peter Clingeleffer

*CORRESPONDING AUTHOR DETAILS:

E Marisa.Collins@csiro.au

T 08 83038605

F 08 83038601

M 0409160355

Date: 12 June 2013

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Abstract

Marisa Collins attended the Ninth International Symposium of Grapevine Physiology and Biotechnology to present field and glasshouse results from the current Grape and Wine Research and Development Corporation (GWRDC) project CSP 09/01. An oral presentation "The role of rootstock conferred vigour in determining crop water-use efficiency" was presented in the grapevine physiology session "Rootstocks water use efficiency and mineral nutrition" and a poster titled "Rootstocks and water-use efficiency: the role of hydraulic conductivity in determining rootstock conferred vigour" was presented in the poster sessions.

Executive Summary

Marisa Collins attended the 9th International Conference on Grapevine Physiology and Biotechnology in La Serena, Chile in April 2013. An abstract on the outcomes of GWRDC project CSP 09/01 "Achieving water use efficiency and improved drought tolerance with rootstocks" was selected for an oral presentation in the "Rootstocks water use efficiency and mineral nutrition" session while a second abstract was presented in the poster sessions. The oral presentation outlined how low-moderate vigour rootstocks can be utilised to improve crop water use efficiency through decreasing canopy size and vine transpiration. The outcomes suggest that irrigation strategies for the different rootstocks can be tailored to reduce actual vineyard water use and that higher density plantings may be practical to overcome yield reductions often associated with low-moderate vigour rootstocks.

The poster explored the mechanisms driving rootstock vigour control which has important implications for vine water use. Experimental results suggest that differences in root hydraulic conductivity and therefore possibly vine vigour are being affected by differences in root size / type or the graft union. The up-regulation of aquaporins in vines with low root hydraulic conductivity also suggests that PIP genes may be playing a role in regulating water flow through the root systems.

During the conference valuable contacts were established and re-established that will be developed into the future. In particular discussions with Nathalie Ollat and researchers from

her laboratory at INRA, Bordeaux were very useful. The focus of Nathalie's group on rootstock / scion interactions examining both molecular and physiology factors is relevant to the upcoming GWRDC project "Genetic and mechanistic characterisation of rootstock traits conferring abiotic stress tolerance to grapevines" FPA 340 with Dr. Mandy Walker and Dr. Everard Edwards. With several research projects in areas that are complimentary to the upcoming GWRDC research project it gave useful insight into the requirement for collaboration between the groups to help focus methods and areas of investigation.

CSIRO and the GWRDC are thanked for funding an operational budget, in-kind support and travel funding for the project.

Background

After being unable to attend national and international conferences several years (due to maternity leave and part-time work) attending the symposium represented an important step in my professional development, giving me the opportunity to connect with key researchers in this field and increase my knowledge of current international research in this field. This knowledge would be particularly valuable going into future projects as they could be targeted to ensure that they make the most of current research before the outcomes are published. It also represented an excellent opportunity to showcase work from GWRDC project CSP 0901 "Achieving water use efficiency and improved drought tolerance with rootstocks".

Project aims and performance targets

Planned project outputs included attendance at the symposium, present an oral paper and to meet / re-establish contacts with key researchers on grapevine water-use and rootstock / scion interactions. With over 250 attendees and 70+ talks the symposium offered excellent insight into current international research in grapevine physiology and molecular biology. Both the oral presentation and the poster were well received with many questions and other researchers actively engaging in research related discussions. This proved useful for meeting key researchers involved in grapevine water-use and rootstock research,

particularly the work on hydraulic conductivity and rootstocks presented in the poster session.

Outcome / conclusion

The opportunity to re-connect with the international grapevine research community and present results from the current GWRDC project was very worthwhile in terms of the insight and ideas gained from other researchers and the feedback on our current work. Valuable contacts made include:

- Nathalie Ollat - INRA, France - head of research group into abiotic stress and rootstock / scion interactions, a research connection which is extremely relevant to the upcoming rootstocks / abiotic stress project for CSIRO
- Hipólito Medrano - University of the Balearic Islands, Spain – head of research group "Biology of plants under Mediterranean conditions" that work on grapevine water-use efficiency utilising both molecular and physiological approaches
- Larry Williams – University of California Davis, USA – Professor and plant physiologist, focussing on vineyard water management and issues related to improving water-use efficiency
- Grant Cramer – University of Nevada, USA – Professor in Department of Biochemistry and Molecular Biology, of particular interest is the molecular / gene approaches to assessing impacts of abiotic stress on grapevines
- Yishai Netzer – Israel – PhD student investigating effects of RDI treatments on xylem characteristics, illustrating novel approach for xylem differences between rootstocks
- Diego Intrigliolo – Valencia Institute for Agriculture Research, Spain – researcher in water relations and grapevine canopy management
- Uri Hochberg - Ben Gurion University of the Negev, Israel – examined physiology and metabolism in respect to hydraulic behaviour which was relevant for the current project
- Julien Lecourt – INRA, France – PhD student investigating the role of N signalling in rootstock conferred vigour, of interest as we are also researching mechanisms driving rootstock conferred vigour

Scientific highlights

Amongst the scientific highlights were work presented by Steve Tyerman and Rebecca Vandeleur (Australia) on the regulation of hydraulic conductivity by aquaporins in roots and leaves. The main conclusion of their work was that removal of leaves and shoots rapidly decreased root hydraulic conductivity (within minutes / hours) presumably through a rapid shoot to root signalling mechanism (currently unknown). This finding has significant implications for vines that are leaf, shoot and hedge trimmed during the season, suggesting that water uptake by the vine will be significantly impacted by these processes in both short and long term time spans.

Larry Williams (USA) from UC Davis, presented an interesting summary of physiological tools to assess vine water status for use in vineyard irrigation management, highlighting that using shaded leaves for measurements of leaf water potential may be the preferred technique over the current sun exposed leaf and stem water potentials.

Uri Hochberg (Israel) working on physiology and metabolism in Shiraz and Cabernet Sauvignon performances under deficit irrigation combined application of metabolic, physiology and anatomical methods in examining the impact of deficit irrigation on hydraulic behaviour. The combined application of methods highlighted both metabolic and physiological interactions in response to water stress that were previously unknown.

The summary of the French “Vit-Sec” project by Nathalie Ollat (INRA) was particularly interesting with the combination of ecophysiology x genomic x genetic approaches being applied to multiple levels of water stress on four arrangements of rootstock x scion combinations with varying drought tolerance. Whilst still a “work in progress” it has the potential to produce some very powerful data sets with genes involved in drought tolerance being identified across cultivars and rootstocks.

PhD student Yishai Netzer (Israel) illustrated the application of a novel technique utilising a wood corer to examine young xylem rings. The cross sectional area of the cores was used to assess the impact regulated deficit and sustained deficit irrigation had upon current season xylem growth and vessel size. Vessel size was significantly decreased by water deficit.