Enhancing capability in grape & wine research through greater international collaboration



FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **GWT 1115**

Principal Investigator: **Dr. Mark Downey**

Research Organisation: **DPI Victoria**

Date: **15 August 2012**

Cover photo: Dr Mark Downey (left) and Hans-Walter Peterson of Cornell University (centre), discuss characteristics of new varieties from the USDA-Cornell grapevine breeding program with Cornell students in up-State New York.

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EXECUTIVE SUMMARY:

In July 2012, Dr Mark Downey travelled to the USA to meet with current and potential collaborators on GRWDC co-funded project; primarily the current DPI tannin research project (DPI 101) as well as projects in development.

Dr Downey, organised and convened a Tannin Summit for collaborators in California where all of the DPI's current collaborators were able to meet, some for the first time, and to share their current research and discuss issues, challenges and priorities for future tannin research.

The critical area that was identified as a priority was to extend the work undertaken by DPI and Constellation in developing a protocol for purifying condensed tannin oligomers (from dimer to decamer) such that large enough quantities of these compounds could be produced to address key research questions. These questions include the sensory character of pure tannins and their interactions with other grape and wine components as well as their evolution in wine and contributions to wine colour and mouthfeel.

Dr Downey also visited several research groups in the USA to develop and expand on collaborative research opportunities. These discussions centred around future collaborative exchanges of PhD students and researchers from a number of agencies to Australia (DPI Mildura) and for DPI researchers to jointly undertake collaborative research activities in the USA during 2013. New collaborative opportunities around grape and wine tannin chemistry were identified with Dr Gavin Sacks at Cornell University.

OBJECTIVES:

1. To facilitate a tannin summit between the GWRDC funded project “Tannin Structure Function Relationships” DPI 1001 collaborative partners, DPI Victoria, E&J Gallo Winery, Constellation Wines US, Washington State University and the University of California, Davis.
2. To reinforce existing and establish new collaborative research relationships with key US and European agencies involved in grape wine research topics where DPI Victoria has capability and expertise that provides RD&E support to the grape and wine industry nationally, i.e. grape and wine tannins, climate change and smoke taint.
3. To build a professional network with fellow researchers in Europe by visiting University of Palermo (Sicily, Italy), INRA at Montpellier (France) and Geisenheim (Germany) to meet with Hélène Fulcrand and Véronique Cheynier (INRA) and Hans Schultz and other scientists involved in or interested in anthocyanin and/or tannin analysis and climate change.
4. To communicate research outcomes from the GWRDC funded project “Tannin Structure Function Relationships” DPI 1001 to the wider scientific community and increase awareness of other tannins research being undertaken elsewhere by attending the 26th International Conference on Polyphenols in Florence, Italy.

DELIVERY AGAINST OBJECTIVES:

1. A Tannin Summit was organised by Dr Downey and held in Lodi (California) on July 9th, 2012. The Tannin Summit was attended by researchers from E&J Gallo Winery, Constellation Wines US, Washington State University and the University of California, Davis. All groups presented results of recent research activities and discussed issues and challenges as well as future tannin research priorities. Many of these collaborators had not met before and the Tannin Summit was the first occasion where the E&J Gallo and Constellation research groups had been in the same room and discussed their work.

   At the Tannin Summit, researchers from each of the group presented a summary of the current and recent research activity. Presentations covered advances in separation technology and capability for oligomers and polymers, progress in understanding tannin interactions with other wine components, tannin extractability into wine, viticultural management and harvest decision-making as well as sensory analysis of purified oligomers.

   The Tannin Summit was a closed meeting, meaning that pre-publication results were discussed openly with the assurance that these would not be discussed or disseminated outside of the group, but would inform the groups future direction. The meeting also sought to identify research, analytical and experimental challenges as well as new opportunities and several synergies within current activities were discovered in a positive and constructive environment.

   Previously, there had been little or no formal or informal interaction between E&J Gallo and Constellation research groups, although both groups had a long history of collaboration with DPI Victoria. Since that meeting a dialogue has been established between the E&J Gallo and Constellation research groups.

   The Tannin Summit also identified priorities and next steps. These were to scale up our preparation of pure tannin fractions for general use within the group, for that work to be lead by WSU with E&J Gallo and Constellation to provide funds based on a business case to be prepared by Mark Downey and Jim Harbertson. It was also agreed that E&J Gallo and Constellation would establish a fund to support ongoing exchanges between the USA and DPI Victoria.

   Following the Tannin Summit, Dr Downey travelled to UC Davis and discussed exchange of a PhD student, Scott Frost, in 2013 and the research objectives and outcomes likely from that work as well as finalisation of an MoU between DPI and UC, which has been in development for around 12 months. The traveller also undertook to explore collaborative tools (eg. Dropbox, Mendeley) that would assist the Tannin Summit group to share ideas and information outside of a once-a-year meeting.

2. As a result of reduced funding from GWRDC and a commensurate decrease in DPI funding, this component of the proposed travel could not be delivered as outlined in the original travel application. With a reduced budget, priority was given to travel that supported delivery of current projects; primarily DPI 1001.

   However, recognising the importance of establishing a collaborative relationship with researchers at the Geisenheim State Research Institute (Germany) involved in free atmospheric CO_2 enrichment (FACE) research for the success of the GrapeFACE project currently under development, Dr Downey was able to draw on other travellers from DPI and CSIRO to meet with potential collaborators. Dr Ian

Goodwin (DPI) met with Professors Hans Schultz (Director, Geisenheim Research Institute) and Peter Braun to discuss the opportunity for a MOU with RheinMain University of Applied Sciences and future research collaboration utilising the new grape-apple-vegetable FACE facility. Dr Everard Edward's travel is detailed in a separate report (VII International Symposium on Irrigation of Horticultural Crops – Travel 2012). Briefly, Dr Edwards visited the FACE sites at Geisenheim and discussed collaboration opportunities and the GrapeFACE project currently being jointly developed by DPI and CSIRO.

3. As a consequence of the reduced budget and scope of travel, this objective was only partially met. Dr Ian Goodwin and Dr Everard Edwards met with researchers from the Geisenheim State Research Institute including Prof. Hans Schultz, Dr Peter Braun and Dr Manfred Stoll. Future opportunities will be sought for Dr Downey to meet and develop opportunities with these and other groups identified in the initial proposal.
4. As a consequence of the reduced budget and scope of travel this objective was not achieved. While research outcomes were communicated within the Tannin Summit group, there was not an opportunity to discuss research with potential collaborators in Europe, particularly France (INRA). In addition, Dr Downey travelled to New York State and met with researchers from the USDA and Cornell University to gain an appreciation of grape and wine research in New York. Future collaborative potential exists between DPI and Cornell in grape and wine phenolic research with Dr Gavin Sacks, Dr Anna-Katherine Mansfield and Dr David Manns.

   Dr Sacks will visit Australia in 2013 to attend the 15th AWITC and will be invited to visit the research facility and group at DPI Mildura. Dr Sacks' current research is expanding into condensed tannin analysis in grapes and wines of American hybrid varieties as part of the ongoing breeding program, Issues have identified with very low tannin concentrations in wines made from these varieties.

   The Cornell/USDA groups based at Geneva and Ithaca, e.g. Dr Jim Meyers and Dr Justine Vanden Heuvel, have biophysical modelling capability that could usefully support a number of areas of DPI viticultural and horticultural research and potentially other viticultural research groups nationally. Discussion will continue with these groups to identify and pursue collaboration opportunities and possibly to visit Australia.

RECOMMENDATIONS & FUTURE ACTIONS:

1. Develop funding case for E&J Gallo and Constellation to resource areas of collaborative work of benefit to collaborative partners, eg. purified oligomer production and identify collaboration tools for group.
2. Explore opportunities to include researchers from the Australia Wine Research Institute (AWRI) in the next Tannin Summit.
3. Develop plans for further tannin research exchanges between the USA and DPI that will enable Rachel Hanlin (DPI) to spend time working jointly with researchers from WSU and Constellation in Prosser, WA and for researchers from Constellation and E&J Gallo to visit Mildura in 2013.

4. Finalise MoU and student agreement with UC Davis for Scott Frost to undertake part of his PhD program at DPI Mildura in 2013.
5. Make arrangements for Dr Gavin Sacks to visit the tannin research group and research facility at DPI Mildura and explore opportunities for future collaboration during Dr Sacks' visit to Australia in 2013.
6. Explore collaborative opportunities to access and exploit horticultural modelling capability with Dr Jim Meyers, Cornell University.