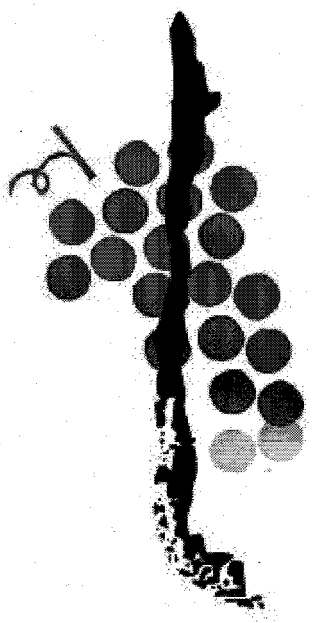
NATIONAL Wine & Grape INDUSTRY CENTRE

GWRDC GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

STUDY TOUR TO CHILE



7th International Workshop on
Grapevine Trunk Diseases

FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

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1. Abstract

A paper was presented at the 7th International Workshop on Grapevine Trunk Diseases (IWGTD) in Santa Cruz, Chile. The workshop provided the opportunity to exchange and discuss latest advances in grapevine trunk disease research with researchers from 17 different wine producing countries. Presentations of the workshop focused on vine decline diseases and complexes: Botryosphaeria canker and bunch rot, Eutypa dieback, Esca, Young vine decline, and Petri disease. New findings covered the areas of pathogen identification and characterisation, disease detection and losses, host-pathogen interactions as well as disease management for vineyards and nurseries. Existing collaborations with researchers from laboratories and universities in New Zealand, the United States of America, Italy and South Africa were strengthened while new contacts were established with colleagues from Chile, Austria and Spain. Collaboration with Chilean researchers was extended through a visit to the Universidad de Chile in Santiago. Newly gained information will be conveyed to fellow researchers at the NWGIC and industry personnel through the NWGIC seminar series and the assistance of extension officers.

2. Executive Summary

The 7th International Workshop on Grapevine Trunk Diseases (7th IWGTD) took place at Santa Cruz Plaza Hotel, Santa Cruz, in the Colchagua Valley, Chile. From the 17 to 21 January, 2010 the 104 delegates from 17 grape growing countries presented and discussed the recent outcomes of grapevine trunk disease research. Authors presented their papers and posters over four sessions focusing on:

1. Pathogen identification and characterisation
2. Disease detection and losses
3. Host-pathogen interaction and
4. Disease Management (Chemical, Biological and/or cultural practices)

Presentations covered a range of pathogens associated with diseases and disease complexes leading to grapevine decline. Particular focus was given to fungi of the Botryosphaeriaceae, Diatrypaceae, Phaemoniella sp., Phaeoacraemonium spp., Phomopsis spp., Seimatosporium spp., Sorosphaera spp., and Cylindrocarpon spp. While similar to the previous IWDTD workshop conducted in Florence in 2008, the majority of presentations covered Botryosphaeria canker, Eutypa dieback, Esca and Petri disease. The 7th IWGTD also covered less prominent trunk disease pathogens such as Black foot, Young vine decline and Botryosphaeria bunch rot. The large abundance of presentations on the Botryosphaeriaceae highlighted the importance of this family of pathogens to grapevines. The Botryosphaeriaceae fungi have now been recognised globally following their first association with Bot canker disease in 2003. This disease has been accepted and dealt with as one of the major concerns to established vineyards.

A field trip to view a typical vineyard in the Colchagua Valley was well received by researchers. This allowed an appreciation of the grape varieties grown in the region and the limitations experienced by vineyard owners and managers. Valuable information on the management of trunk diseases was also transferred from the researchers to the vineyard managers during this field trip.

A newly established website (http://icgtd.ucr.edu/index.htm) was also introduced at the workshop and attendees were invited to contribute to this site through the submission of disease symptom photos. It is hope that this website will become a portal for those seeking information on grapevine trunk diseases.

Attendance at the workshop allowed collaborations with researchers from New Zealand, UC Davis, Italy and South Africa to be re-established. Areas discussed included epidemiology of Bot canker, techniques for dormant bud and berry inoculation, spore production, spore dispersal and the possibility of post-doctoral project opportunities. New collaborations were formed with researchers from Chile, Austria and Spain. A visit to the Universidad de Santiago with Drs Jaime Auger and Marcella Esterio provided insight into the research projects being conducted in the area of grapevine trunk diseases, particularly Bot canker, in Chile.

The information gathered at the workshop as well as the book of abstracts is shared with researchers of the trunk diseases group at the NWGIC. In addition, I plan to present some of this information together with the final results of my PhD project as part of the NWGIC seminar series.

Acknowledgements go to the GWRDC, NWGIC and CSU for financial support to attend and participate in the 7th IWGTD and visit the plant pathology laboratories at Universidad de Chile, Santiago.

3. Background

Species of Botryosphaeriaceae have been associated in Australia, as well as worldwide, with a disease of grapevines referred to as Bot canker, excoriose, Diplodia dieback or black dead arm (Larignon et al., 2001; Savocchia and Laurent, 2005; Van Niekerk et al., 2006). The disease has been studied quite intensively and research is ongoing in order to find more efficient and sustainable ways of protecting vineyards from infection by Botryosphaeriaceae and to manage Bot canker in infected vineyards. While Botryosphaeriaceae are frequently isolated from grapevine trunks and cordons and identified as a wood pathogens, little research has been conducted regarding the effect of the Botryosphaeriaceae on berries and other grapevine tissue.

My PhD project has focussed on the role of Botryosphaeriaceae as bunch rot pathogens of grapevines, with infected wood as the inoculum source. To our knowledge this project is the only study in Australia researching at Botryosphaeria bunch rot. Results from surveying two vineyards in the Hunter Valley (NSW) for Botryosphaeria infection of grapevine buds, flowers and fruit at different phenological stages were presented at the 6th International Workshop on Grapevine Trunk Diseases. Discussing these results with peers and international experts on *Botryosphaeria* was highly productive and allowed us to successfully develop new experiments using new techniques and fresh approaches. In particular communication with the *Botryosphaeria* group at Lincoln University in New Zealand led by Dr Marlene Jasper, resulted in improved spore production methods. Constructive feedback on my survey results with Dr Ian Harvey from Plantwise, NZ, and Dr. Douglas Gubler from the University of California, Davis created ideas on how to improve the survey for the second season.

At the meeting it was established that Dr Jaime Auger's research group from the University of Chile has seen similar results to those of my survey for the occurrence of Botryosphaeriaceae in dormant buds and berries when inspecting table grapes grown under similar dry climatic conditions to those in Australia. This group has since started to focus on the implications of Botryosphaeriaceae on the local table grape industry. In particular they have developed a keen interest in their role as bunch rot pathogens.

The purpose of this travel was to present results that have been obtained since the last meeting and to receive scientific feedback from peers. Workshop attendance is also important for keeping abreast of the latest directions in grapevine trunk disease research

by researchers of other important wine producing countries. In addition, presenting my results as a postgraduate student of the School of Agricultural and Wine Sciences based within the National Wine and Grape Industry Centre (NWGIC) at Charles Sturt University in front of peers and other PhD students will promote the School and NWGIC and create interest for potential new post-graduate candidates planning to conduct their research in Australia.

4. Objectives

The objectives of this project were to:

1. Present the final results of my PhD project titled "Molecular identification and pathogenicity of *Botryosphaeria* spp. the causal organism of Botryosphaeria canker and bunch rot in grapevines" as an oral paper at the 7th International Workshop on Grapevine Trunk Diseases
2. Obtain information on current research on an international level on grapevine trunk diseases, in particular *Botryosphaeria.*
3. Network with international researchers, establish and maintain collaboration between Australian and international groups working on grapevine trunk diseases and *Botryosphaeria*
4. Improve personal skills of presenting results in front of peers and networking
5. Obtain knowledge about the most recent improvements in trunk disease management and convey it to the Australian wine industry on my return.

The first aim has been achieved with the presentation of my paper "Botryosphaeriaceae associated with bunch rot of grapes in South Eastern Australia", which received good feedback and some suggestions on future experiments were discussed with peers. The abundance of presentations on Botryosphaeria at this meeting allowed me to obtain a large amount of new information on the pathogen from researchers of 17 wine producing countries and establish new collaborations with researchers working on similar topics. Receiving good feedback and being able to discuss my presented results with my peers during the sessions as well as after the workshop allowed me to plan the rest of my project and adjust research techniques. In addition talking in front of this highly specific and critical audience of peers strengthened my confidence as a researcher and developed my presentation skills. After returning to Australia I was able to convey the gathered information to my fellows in the Vine Health Group at the National Wine and Grape Industry Centre as well as to our extension officers for further distribution. This information is planned to be further distributed to the industry during the next Spring Vine Health field days.

5. Methods

Not applicable

6. Results/Discussion

During the first day of the congress I presented my paper titled "Botryosphaeriaceae associated with bunch rots of grapes in south eastern Australia". It was part of the 'Pathogen Identification and Characterisation' session, in which also a variety of new molecular diagnostics techniques including qualitative as well as quantitative methods were introduced ((Baskarathevan et al., 2010; Probst et al., 2010; Travadon et al., 2010). The highlight of the disease detection and losses session was a presentation on crop loss models for Eutypa dieback(Jordan et al., 2010). It indicated how such a model could be

used for any disease in order to assist growers in assessing the economic value/loss of the disease and finally in decision making about disease management options.

Host pathogen interactions were demonstrated by research on several grapevine trunk disease pathogens and their production of toxins and metabolites causing plant degradation. A scanning electron microscopy study on detached and undetached shoots inoculated with *Botryosphaeria* showed that this fungus does not have the potential to infect shoots and leaves unless they are wounded prior to infection(Amponsah et al., 2010). It also showed that infection by *Botryosphaeria* is much more rapid on detached grapevine material than on living tissue, leading to the conclusion that grapevines have a defence mechanism in place to reduce disease development. The same study also highlighted that pathogen progression was more advanced in the upward direction along with nutrient flow in the xylem than in the downward direction.

The disease management (Chemical, Biological and/or cultural practices) session presented new strategies for the prevention and control grapevine trunk diseases. Traditional remedial surgery, widely used for the control of Eutypa dieback and Bot canker in Australia, and results of fungicide trials including disease control using biocontrol agents such as *Trichoderma* were discussed. An interesting discussion developed during this session on hygiene practices and contamination of nursery materials.

In a final discussion session of the workshop an update was given on the grapevine trunk disease council's upcoming activities, a newly established website (http://icgtd.ucr.edu/index.htm) and the possibility to publish papers presented at the workshop in the Phytopathologia Mediterranea journal. Researchers were encouraged to share their information on grapevine trunk disease activities, job opportunities and projects, as well as newly found diseases/pathogens on this website. A call to publish pictures of disease symptoms was made in order to start up a data base to be used as a disease detection tool. A proposal was made to hold the 8th International Workshop on Grapevine Trunk Diseases in Spain in September 2012.

As part of the workshop, a one day field trip was hosted by Vina Santa Cruz allowing researchers insight into the grape production process of a typical vineyard in the Colchagua Valley. Vina Santa Cruz is located in the Lolol, one of the 11 subregions in the Colchagua Valley, Chile's wine region number VI. The major varieties grown here are Carmenere and Cabernet Sauvignon. The region is famous for its Carmenere, an old French variety from Bordeaux which was brought to Chile in the late 1850s by the French. However, Camernere was mistaken to be Merlot and produced under this label until 1994 when it was rediscovered by oenologists. Typical symptoms of dieback as well as internal wood symptoms of Petri disease and Esca caused by *Phaemoniella* spp. were observed in several of the plantings on the property. Current management techniques including remedial surgery were discussed with vineyard management and staff. It was noted that Esca leaf symptoms, typically produced by the pathogens in other countries were absent.

During the workshop collaborations were re-established with Dr Ian Harvey (Plant Wise, Lincoln, New Zealand) for the discussion and feedback on epidemiological studies, Dr. Marlene Jasper and Mr Nicholas Amponsah (Lincoln University, New Zealand) to exchange and debate methods of dormant bud and berry inoculation with Botryosphaeriaceae as well as spore production. Valuable feedback was obtained from Drs Douglas Gubler (UC Davis, USA) and Laura Mugnai (University of Florence, Italy) regarding spore dispersal of Botryosphaeriaceae. A meeting was held with Dr. Francois Halleen (ACR- Infruitec Nietvoorbij, South Africa) to discuss potential post doctoral

project opportunities. New contacts were established with colleagues from Chile, Austria and Spain. Collaboration with Drs Jaime Auger and Marcella Esterio (Universidad de Santiago, Chile) was extended through a visit to the Agronomy and Forestry Faculty and in particular the plant pathology laboratories at the Antumapu campus in Santiago's South. This visit allowed the comparison of problems and challenges faced by a research group structured in a similar manner to the Vine Health group at the NWGIC. While the topics of research and consequently the research methods used by both groups are very similar due to climatic conditions and pathogen occurrences in the grape growing regions in Northern Chile and South Eastern Australia, there are major discrepancies in available resources. It is anticipated that we will exchange research ideas with this group more frequently in the future.

7. Outcome/Conclusion

Not applicable

8. Recommendations

Being present at the most specialised meeting for grapevine trunk disease research is important for Australian researchers as well as for the international research community. While the majority of grapevine trunk disease pathogens have only been studied in regards to infection of the wood, it was established that further research is required to understand the alternative pathways of infection into grapevines. This is important because this can act as an inoculum source for the rest of the vineyard as well as other surrounding plants.
While advances in technology have enabled the development of more rapid diagnostic tests for trunk diseases it has to be taken into account that not each strain of the common trunk disease pathogens listed above is actually pathogenic under all environmental conditions. Emphasis needs to be placed on the increase in susceptibility of grapevines to pathogens under stress. In addition, many grapevine pathogens will only be harmful to the plant under ideal environmental conditions and temperature range appears to play an important role in the virulence of fungal trunk disease pathogens. This leads to the conclusion that pathogenicity data collected in one part of the world does not necessarily apply to grapevines grown in other climatic regions. Disease crop loss models based on pathogen effectiveness and economic loss are a valuable tool for growers to assist decision making in disease management. Research has allowed more accurate and rapid identification of grapevine trunk diseases as well as more efficient methods of control, however, the best control is still prevention of the disease. This starts at the very early stage of vineyard establishment. It is therefore highly important to assess the "cleanliness" of nursery material before bringing it into the vineyard. This calls for stricter tests of the material as well as a better quality assurance system for the industry. Current hygiene techniques practiced by the nurseries need to be assessed for their relevance to the particular pathogen they are aimed for.

9. Appendix 1: Communication

The information gathered at the workshop as well as the book of abstracts are shared with the researchers of the Vine Health group at NWGIC and other plant pathology researchers at CSU. In addition, it is planned to present some of this information together with the final results of my PhD project as part of the NWGIC seminar series and further distribute the information to the industry during the next Spring Vine Health field days.

10. Appendix 2: Intellectual Property

Not Applicable

11. Appendix 3: References

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12. Appendix 4: Staff

Nicola Wunderlich