Practical management of grapevine trunk diseases

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Grapevine trunk diseases

Eutypa dieback (ED) and *Botryosphaeria* dieback (BD) are major trunk diseases worldwide, causing significant yield reduction and threatening the sustainability of Australian vineyards. Fungal species of the *diatrypaceae* and *botryosphaeriaceae* infect vines primarily through pruning wounds, then colonise in wood, causing dieback and death (Figure 17).

Trunk diseases rank in the top five priority diseases of the Australian winegrape industry; becoming more prevalent as vineyards mature.

Figure 17. Vine with trunk canker.

Research led by the South Australian Research and Development Institute (SARDI), in collaboration with the National Wine and Grape Industry Centre (NWGIC) with funding from Wine Australia and industry, has focused on developing practical management strategies for grapevine trunk diseases such as *eutypa* and *botryosphaeria* dieback (Figure 18 and Figure 19). The aims of this project were to determine the extent and distribution of ED and BD pathogens, to develop efficient methods of pruning wound management and control of these diseases.

Research highlights

Inoculum dispersal throughout the pruning season

A three-year study investigated the spore dispersal patterns of ED and BD pathogens using Burkard spore traps (Figure 20). DNA-based molecular tools were developed to detect inoculum from spore trap tapes (Figure 21), and showed that spore dispersal patterns vary in regions with different climates. Rainfall was confirmed as the primary factor that triggers the release of spores, with as little as 0.2 mm of rain initiating spore release.

Since wine regions in Australia are widely distributed with highly diverse climates, the comprehensive spore trapping in four major wine regions in this study provides beneficial information on the spore release patterns of ED and BD pathogens. Once the data from this and current research are analysed, the critical times of the year when ED and BD spores are abundant in vineyards will be determined. This will help growers make decisions on the best time to prune their vines to avoid infection or to apply pruning wound protectants.

Figure 18. Wedge staining in the trunk wood caused by *eutypa* and *botryosphaeria* dieback pathogens.

Figure 19. Central staining in the trunk wood caused by *eutypa* and *botryosphaeria* dieback pathogens.

Figure 20. Burkard spore trap.

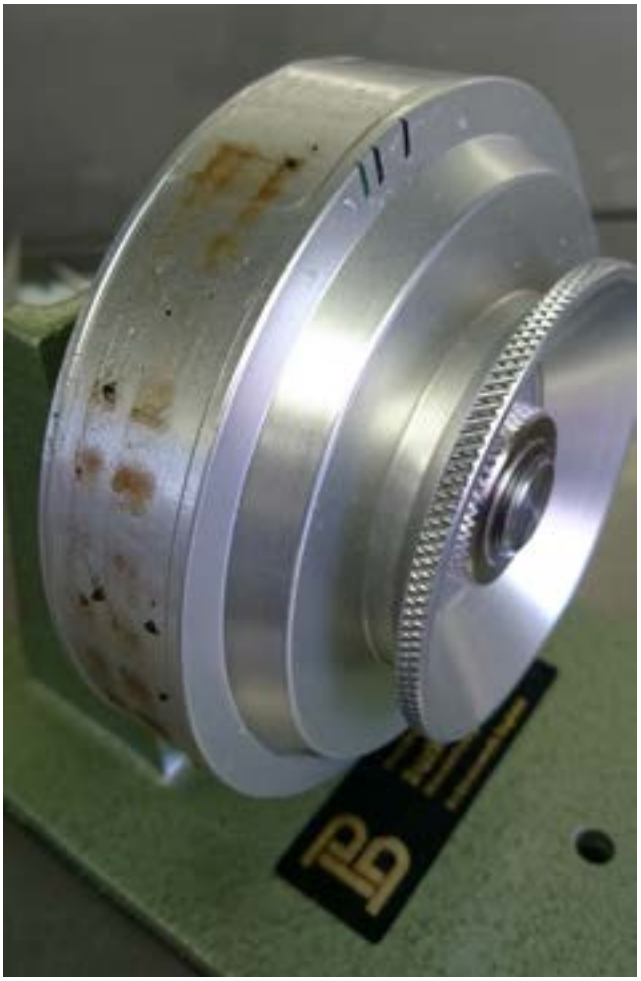

Figure 21. Exposed spore tape on the drum, used for trapping spores in vineyards.

Duration of pruning wound susceptibility

Vineyard trials in McLaren Vale, SA and Wagga Wagga, NSW have provided new information on the timing and duration of wound susceptibility to ED and BD pathogens. Results revealed that wounds were highly susceptible for two weeks following pruning, after which the susceptibility often decreased sharply, although at varying rates for each of the pathogens evaluated and between years.

Detached cane assays conducted in the greenhouse showed that wound susceptibility did not differ between varieties commonly grown in Australia. These results suggest that, at these trial locations, there might be little advantage in choosing one pruning time over another in terms of minimising the risk of infection by trunk disease pathogens. However, results highlight the importance of protecting pruning wounds for at least two weeks post-pruning.

Further research is required to evaluate ED and BD pathogens in other regions to provide localised recommendations for Australia's diverse range of climates.

Optimal timing of wound protection treatments

Field trials were established to assess fungicide application timing relative to pruning for controlling ED and BD.

The results indicate that the fungicides pyraclostrobin, fluazinam and tebuconazole can control ED and BD when wounds are treated up to 6 days after infection, and will continue to provide control of both pathogens for 1–2 weeks. Therefore, if applied six days post-pruning, a single application could provide up to three weeks of wound protection.

This is likely to improve logistics for grape-growers and, together with effective fungicide application with commercial sprayers, will encourage greater adoption of wound protection strategies to control grapevine trunk diseases.

Remedial surgery to control *botryosphaeria* dieback

Remedial surgery, which has previously been shown to control ED, was evaluated as a curative control strategy for grapevines with BD.

Figure 22. Trunk being cut at mid-point between ground and crown.

Three vineyards (own-rooted and grafted) were assessed for visual symptoms, followed by cutting trunks (Figure 22) at different heights and recording the severity of cross-sectional staining in remaining stumps. Wounds were painted and then vines were monitored for water-shoot production and visually assessed for disease severity (Figure 23 and Figure 24).

Figure 23. Cut trunks being sealed with pruning wound dressing following remedial surgery.

Figure 24. Cut trunks were sealed with pruning wound dressing following remedial surgery.

The vines recovered and were able to produce new shoots after remedial surgery, although grafted vines tended to produce shoots from the rootstock rather than the scion. The severity of dieback in untreated vines increased by 5–10% each year which, with no intervention, would eventually lead to vine death.

To date, no symptoms have been recorded on vines treated with remedial surgery, but vines will continue to be monitored to determine the strategy's long-term success. Future research will investigate remedial surgery for grafted vines and evaluate novel methods of water shoot induction to try and improve the technique's success.

Identify tolerant or resistant germplasm

The SARDI germplasm collection, located in the Barossa Valley, was visually assessed for symptoms of trunk disease. Varieties with low disease severity were selected for evaluation of disease progression.

Results showed that variety susceptibility to dieback varies, with some germplasm identified as having tolerance potential. Preliminary evidence of reduced susceptibility in some clones and rootstocks warrants further investigation.

Impact of drought and regulated irrigation

Water deficit trials were established in the Barossa Valley and Riverland regions of South Australia in 2008 and 2011, respectively. The trial results showed increased water stress did not increase the susceptibility of canes to colonisation by trunk disease pathogens, suggesting that drought and deficit irrigation practices are not likely to contribute to an increased prevalence of grapevine trunk disease in Australian vineyards.

Summary

These outcomes provide new information that is leading to improved strategies being adopted for managing trunk diseases. This will increase vineyard longevity in Australia's diverse climates.

Current research aims to develop new and improved management strategies to prevent and control grapevine trunk diseases. It will also contribute to improving vineyard performance by identifying clones and rootstocks with tolerance to trunk disease and provide new knowledge on the role of vine propagation in disease spread. A better understanding of the epidemiology of trunk disease pathogens will allow targeted control methods, thereby reducing vineyard inputs.

Improved application methods will optimise chemical fungicides use to control trunk diseases. Biological and alternative wound protectants will help minimise adverse effects on the environment.