The influence of water deficit on grapevine trunk disease

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Introduction
The grapevine trunk diseases eutypa and botryosphaeria dieback are prevalent in Australia. Water stress is thought to contribute to increased disease severity, particularly through drought and deficit irrigation practices. Although previous research indicated that expression of foliar symptoms and susceptibility to infection of wounds to infection by Eutypa lata increased under water stress, there is no information on disease progression in such conditions.

Methods
- A trial was established in the Riverland, South Australia to investigate the effect of deficit irrigation on the extent of colonisation of grapevine wood by trunk disease pathogens
- From 2011, Cabernet Sauvignon vines were subjected to four irrigation levels; 100, 50, 25 and 12.5% of the standard irrigation program, applied using under-vine sprinklers (Fig 1)
- In winter 2013 and 2014, vines were pruned and inoculated with spores of E. lata (eutypa dieback) and Diplodia seriata (botryosphaeria dieback).
- To compare the distance colonised, treated canes were removed 12 months after each inoculation and assessed in the laboratory by re-isolation of the pathogens from consecutive sections cut along the canes.

Results
- During both growing seasons, pressure chamber readings confirmed various degrees of stress, with leaf water potential ranging from 6 to 12 Bar for irrigation treatments 100 to 12.5% (Fig 2)
- There was no difference among treatments for incidence of infection (data not shown)
- E. lata colonised the canes significantly further in vines provided with 100% irrigation (106 and 80 mm in 2013/14 and 2014/15, respectively) than in those that received 12.5% (60 and 61 mm, respectively)
- There was no difference in colonisation by D. seriata among irrigation treatments (38-51 and 21-34 mm, respectively)
- Overall, E. lata colonised canes 22-66 mm further than D. seriata.
- Extent of staining in cane tissue did not differ between pathogens or irrigation treatments
- The mean distance at which pathogens were recovered from canes ahead of the staining ranged from 39 to 86 mm (E. lata) and 5-26 mm (D. seriata)

Conclusion
Water deficit did not increase the susceptibility of grapevine canes to pruning wound infection and colonisation by trunk disease pathogens and, for eutypa dieback, there was evidence of decreased susceptibility to colonisation in vines under severe water deficit. These results suggest that drought and deficit irrigation practices are not likely to contribute to an increased prevalence of grapevine trunk disease observed in vineyards. These trials have shown that E. lata progresses at a greater rate than D. seriata, contrary to previous reports based solely on staining. They also confirm the recommendation of cutting a further 10 cm beyond staining when conducting remedial work to ensure that pathogens are removed.

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Figure 1. Rotor Spray™ under-vine sprinkler used to deliver deficit irrigation treatments (left) and four-cordon spur-pruned vines with treated canes tagged in the vineyard trial (right).

Figure 2. Effect of irrigation treatment on recovery distance of Eutypa lata (light green columns) and Diplodia seriata (light blue columns) from pruning wounds in canes, and associated staining of wood (dark green and blue columns, respectively). Recovery distance of either pathogen from non-inoculated controls (NIC) is indicated by black columns, and staining in grey columns. Red line represents the mean leaf water potential (LWP). Bars represent standard error of the mean.