Executive Summary

The effect of canopy structure, berry cell death and berry shrivel on quality of Shiraz.

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Shiraz is the most predominantly grown red variety in Australia. However, this variety has been found to be susceptible to berry shrivel in the later stages of ripening, starting prior to flavour development and harvest maturity. A link between berry cell death and berry shrivel has been found in previous research, which requires further investigation to assess potential techniques to reduce this problem that can result in reductions of yield up to 30% in Shiraz. It is also thought that the climate change scenarios predicted for viticultural regions in Australia will exacerbate this problem due to higher ambient temperatures and reduced water availability for irrigation. Therefore, this research aimed to investigate the effect of vineyard management practices, such as rootstock selection (own roots, Schwarzmann and 110 Richter) and irrigation regimes (irrigated and non-irrigated) on canopy structure, berry cell death and berry shrivel.

The trial was based at the SARDI Research Centre, Nuriootpa (Barossa Valley) for the season 2009-10. Novel techniques to determine berry cell death, berry shrivel and canopy structure were used for this study. These techniques involved laboratory assessment of fluorescence stained berries and microscopy. Semi-automated digital image analysis techniques were used for fluorescence berry images and for under-canopy digital images to obtain automatically critical structural parameters and leaf area index (LAI).

Results showed maximum berry living tissue (LT) from pea size until 90 days after anthesis (DAA). After this date, a steady decline in LT was observed reaching a minimum of around 60% to 68% for non-irrigated and irrigated plants respectively at 133 DAA. Since the 2009-10 season was considered a mild season for evapotranspiration there were no significant differences in the studied parameters according to rootstocks and irrigation regimes. High correlations between berry cell death and berry deformability and shrivel for all treatments were found. The LAI technique showed results consistent with seasonal patterns of canopy cover, porosity and LAI expected from berry setting until harvest.

This study demonstrated the applicability of these novel techniques developed to assess berry cell death and shrivel in the field and to monitor canopy architecture. These techniques will be helpful to obtain better maturity indices and to assess the impacts of abiotic stresses and the possible ameliorating effects of rootstocks and irrigation strategies.