EFFECT OF CLIMATE AND CULTURAL PRACTICES ON GRAPEVINE FLOWERING AND YIELD COMPONENTS

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<u>CHAPTER THREE</u>: Analysis of yield component variation from different bearer node numbers in a mechanically pruned system

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ABSTRACT

This thesis presents results from two separate studies. First, the impact of bearer length on yield components within the canopy was investigated in season 2005/06, on a commercially-managed, mechanically-pruned vineyard of *Vitis vinifera* L. Cabernet Sauvignon in Coonawarra, South Australia. Pruning resulted in the retention of bearers with 1-7 nodes, with the weighted average bearer length being two nodes for the canopy. As bearers of one to five nodes in length were the most common, these were studied. Yield components (on a per shoot basis) were analysed according to the node position on the bearer at which the shoot arose. Both budburst and inflorescence number per node were highest at the distal node positions on each length bearer, even if the nodes were at the same positions from the base of the bearer and would normally be expected to have similar fertility. Budburst appeared to act by modifying inflorescence number per node based on the relative location of each node from the apex of the bearer. Shoots that arose from the most distal node positions had the highest flower number per inflorescence and berry number per bunch. Flower number per inflorescence was significantly higher on two-inflorescence shoots than single-inflorescence shoots. The relationship between bunch size and node position, unlike that between inflorescence number and node position, was dependent on bearer length. The relative size of the inflorescence appeared to be affected more so by the node position at which the shoot occurred on the bearer, as opposed to the actual node position on the shoot at which the inflorescence occurred. There was a positive, non-linear relationship between average fruit yield per bearer and bearer length. Although yield was highest from the bearer with the highest node number (five nodes), there was no significant difference in yield per bearer for the bearers of three to five nodes in length. If average bearer length was increased from two to three nodes, the potential yield gain per bearer is estimated at 38 per cent.

The second study presents results of correlations between bunch number and components of bunch weight (flower number and berry number) to investigate co-development of bunch number and bunch size. These data were collected from 4 vineyards in the Limestone Coast Zone of South Australia from *Vitis vinifera* L. Chardonnay, Shiraz and Cabernet Sauvignon during seasons 2002/03 to 2006/07. The significant correlations found between fertility and both bunch weight and flower number per inflorescence suggest that the same factors that affect bunch number in a particular season will also affect bunch size. When inflorescence primordia were initiated and differentiated

under cool conditions, actual bunches per node and flowers per inflorescence were low. Differences in climate between the vineyard sites were found to be minimal and therefore did not strongly affect the magnitude of the yield components at the vineyard sites. Cultural practices at each vineyard site were sufficiently variable to affect fertility levels. Genotype is thought to determine the range of flowers per inflorescence that a variety can potentially carry, whereas actual flower number per inflorescence is thought to be determined by inflorescence primordium initiation and differentiation temperatures, as well as temperatures during budburst. Despite significant correlations between flower number per inflorescence and berry number per bunch, flower number per inflorescence pre-flowering for Cabernet Sauvignon, Shiraz and Chardonnay is inversely related to actual percentage fruit set. This is possibly a survival mechanism for the grapevine as it allows the vine to maximise yield each season without detriment to its longevity. Bunches per vine accounted for the majority of the seasonal variation in yield per vine. Fluctuations in bunch number per vine (and therefore yield) are likely to be reduced by varying the number of nodes retained per vine according to the relative fruitfulness per node present pre-pruning. This practice is therefore likely to result in the seasonal variation of berries per bunch becoming a stronger driver of yield.

The commercial impacts of these studies are two-fold. Data presented will assist growers to understand the reasons for which their pruning regimes are affecting yield production and how these pruning regimes may be modified to achieve a target yield—particularly when growers are faced with seasons of low predicted fertility. In addition, data presented will allow growers to improve their crop forecasting accuracy, with a greater understanding of the link between bunch number and bunch size. In the current situation of oversupply in the wine industry, wineries are adopting a tough stance towards growers over-delivering on their grape contracts. Therefore, any assistance that can be provided to growers on improving accuracy of yield estimates will be beneficial both to the grower and winery.

DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution. To the best of my knowledge and belief, this work contains no material previously published or written by another person, except where due reference has been made in the text.

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S.J. McLoughlin
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