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Thesis title: **Managing carbohydrate balance during berry development to optimise berry composition and wine quality in a changing climate**

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Abstract

Topic: position and objectives:

Under the warming climate, canopy management practices are important approaches to manage fruit to produce lower sugar content, reaching lower alcohol concentration still showing desired fruit quality. Research has investigated the impact of slowing down berry ripening by reducing the leaf area by severe summer trimming and leaf removal. The results also demonstrated that the alteration of leaf area and crop load ratio as well as climatic conditions can impact significantly on carbohydrate reserve levels in the perennial structure. **The aim of this study was to understand the altered source-sink relationship by reducing leaf area on berry composition and wine quality, and to investigate the impact on carbohydrate winter reserves.**

Methods:

Four treatments were applied at phenological stage of pea-size using Merlot (*Vitis vinifera* L.) at Wagga Wagga, Australia, during 2011-2012 growing season: 1) lower leaf removal (LLR); 2) upper leave removal (ULR); 3) severe summer pruning (SSP); 4) control (CON). Berry composition parameters, including total soluble solid (TSS), total acid (TA), pH, total anthocyanin and phenolics, were determined from veraison to harvest. Yield parameters were determined at harvest and carbohydrate reserves in the wood were measured at leaf-fall. Small batch of wine were made from different treatments after harvest and sensory analysis were participated after bottling.

Results:

The results showed that different defoliation treatments did not affect yield and grape composition in ripening at harvest, including total soluble solid (TSS), total acid (TA), total anthocyanin and phenolic. The source deficiency induced by leaf removal was mainly present in TSS and total anthocyanin concentration at early development stage of berry maturation after veraison. The total anthocyanin content showed lower amount in defoliation treatments than control. No effects were found in total acid, pH, total phenolic or berry weight in grapes during berry maturation. Reduced amounts of starch and soluble sugars in wood reserves were found in defoliation treatments compared to control at harvest. However, the three defoliation treatments did not show significant differences in wood reserves. In the wine analysis and sensory evaluation, the total phenolic content and aroma attributes constitute have been impacted by defoliation treatments, particular for SSP treatment with significantly lower amount of total phenolic and a high perception of spicy/pepper and red fruit aroma in wine compared to other treatments.

Main conclusions:

The overall response of grape composition to partial defoliation and severe summer pruning prior to veraison suggested that adjusting canopy leaf area before veraison can be considered as one management practice to reduce the velocity of berry maturation with little ripening parameter reduced. However, due to the small ratio of leaf area to fruit weight, the implementation of SSP showed unpleasant attributes during sensory evaluation of the wine quality.

Keywords (5):

climate change, leaf area to fruit weight ratio, grape composition, wood reserve, summer pruning

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