

Master's Thesis Summary

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Thesis Title: Impact of Canopy Manipulation in Grapevine Physiology and Carbon Re-allocation

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Summary (300 words max.)

Problem, background and objectives: During the season 2013 an experiment with three different levels of canopy modification was trialed at Geisenheim (Rheingau, Germany). The variety used was *Vitis vinifera* cv. Riesling, clone Gm 198 grafted onto rootstock 5C. Canopy management consisted of various summer defoliation practices applied post-flowering and over the bunch zone. Girdling of the shoots was used to observe sink to source allocation thus the carbon re-translocation from leaf to shoot. The applied leaf area modifications consisted in the control vines (CON), mechanically defoliated canopy (MDC) and severe summer pruning (SSP).

Methods: To observe the effects on the physiology of the vine, non-destructive methods were implemented to measure stomatal conductance, chlorophyll as well as nitrogen content in leaves. To follow vegetative development the E-L system (Combe, 1995) was used and leaf area was determined. Berry composition was monitored during the maturation period. Prior to harvest yield and berry health; i.e. *Botrytis cinerea* were examined. To determine the potential aroma precursors G-G analyses with determination of total phenols were performed. For the carbohydrate determination wood samples were collected from one year old canes at leaf fall and winter.

Results: It was observed that the nitrogen supply was not limited through the whole season. As a first response the vines were compensating the loss of leaf area by developing lateral shoots and increasing leaf efficiency. Between the treatments significant differences were observed for the NOPA values but neither TSS nor pH and titrable acidity were affected. Nevertheless SSP showed a diminution on the final TSS concentration. Due to the hot temperature with extraordinary rain fall and less sunshine hours yield was highly impacted by *Botrytis cinerea* at harvest. Significant differences were found between treatments. SSP had the highest quantity of healthy berries, followed by MDC and the most impacted were the control vines. The G-G analyses showed a higher concentration of G-G and less phenolic compounds from the berries coming of MDC. Chlorophyll meter readings and chemical analysis were correlated. The analyses of wood samples indicated that carbon re-translocation from leaf to shoot, might be capable to sustain source limitation. Nevertheless it would be recommendable to perform analyses on roots to confirm this conclusion.

Main conclusions: In summary the implementation of mechanical defoliation over the bunch zone (MDC) was considered as a useful tool to adapt to the potential future scenarios of increasing variability of climatic conditions.

Keywords (five): Canopy manipulation, carbon re-allocation, climate change, vine physiology, girdling in shoots.

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