IMPACT OF DEFICIT IRRIGATION STRATEGIES ON TERPENE CONCENTRATION IN GEWÜRZTRAMINER GRAPES

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Abstract:

Context and purpose of the study - Deficit irrigation is a viticultural practice often applied to improve the phenolic composition of red grapes and wines. However, the impact of this practice on grape terpenes – key aromatics for several grapes and wines – remains largely unknown. This study investigated the impact of deficit irrigation strategies on free and glycosylated terpenes in Gewürztraminer grapes.

Material and methods - In a field study conducted in Oliver, BC, in 2016, 2017, and 2018, deficit irrigation regimes were applied to Gewürztraminer vines at different developmental stages (pre-veraison = Early Deficit, ED; post-veraison = Late Deficit, LD; throughout the season = Prolonged Deficit, PD). A well-irrigated control (CN) treatment was also established. Treatments were replicated four times accordingly to a randomized block design. The impact of deficit irrigation treatments on vine physiology and berry metabolism was characterized with eco-physiological, biochemical, and molecular analyses. Starting three weeks after fruit set, midday-leaf water potential was measured every 7-14 days and leaf gas exchanges every 14-21 days. Berry samplings were conducted every 7-14 days to assess the effect of deficit irrigation treatments on berry sugar (total soluble solid, TSS), acid (titratable acidity, TA), and terpene concentration, as well as the expression of terpene genes. Free and glycosylated terpenes were identified and quantified using a SPME-GC-MS and a LI-GC-MS, respectively. Gene expression was analyzed using a quantitative RT-PCR.

Results - Midday leaf water potential, photosynthesis, and transpiration rates were reduced by deficit irrigation. ED, LD, and PD reduced vine yield when compared to CN, but LD reduction was small and not consistent among years. Sugar levels were also reduced by deficit irrigation, particularly by LD and PD. Total free terpenes were marginally affected by deficit irrigation treatments (P = 0.065); however, the concentration of specific terpenes, such as geraniol, was significantly (P< 0.05) higher in LD than in CN berries. LD did not increase the expression of terpene genes (e.g., *VviDXSs*, *VviHDR*, *VviTPSs*), suggesting that the observed increase in the concentration of some free terpenes was not regulated at the transcriptional level. Total glycosylated terpenes at harvest did not change among treatments.

Keywords: Aroma, Grapevine, Ripening, Water Deficit, Yield

1. Introduction.

