Dynamics of soluble sugars metabolism in differently cold-tolerant grapevine cultivars during bud dormancy maintenance and release

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Climate change is globally recognized as a multifaceted threat to viticulture performance. The increase of average surface temperatures is the cause of an acceleration of phenological development of grapevine cultivated varieties, which is predicted to persist in the future. This, together with the expected challenge represented by late frost occurrences in several geographical regions, will increase grapevine exposure to freezing damage risk in the future. Green tissues are in fact significantly more sensitive to freezing temperatures compared to woody ones because of their higher water content, making spring frosts a danger to grapevine production and yield. Soluble sugars (SS) have been shown to function as cryoprotectants, osmolytes and stabilizers of proteins during cold exposure. The increase of SS concentration has been positively correlated to cold acclimation of overwintering plants. Freezing tolerance and cold hardiness are dynamic processes which change depending on *Vitis* species, area of origin and cultivar. Understanding how these phenomena operate is necessary to improve varietal selection and adapt grapevine cultivation to a changing climate. In this study, *Vitis* hybrid cultivars Fleurtai and UD 31-103 (Merlot x Kozma 20-3), characterized by different levels of cold resistance to winter freezing temperatures, were studied. In 2019-2020 winter season, buds were sampled at 15-days intervals in order to measure SS content during dormancy progression to dormancy release. Additionally, RNA was extracted and real-time PCR was used to assess expression of SS metabolism-related genes. Bud water levels were monitored throughout the season. The relationship between freezing tolerance and the observed physiological changes is discussed.

Keywords: osmoprotectants, gene expression, *Vitis vinifera*, climate change, freezing tolerance.