

Cumulative effects of repeated drought stress on berry composition, and phenolic profile: Field experiment insights

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Abstract

Drought stress has a profound impact on grapevine productivity and significantly alters key quality-related traits of berries. Although research has been conducted on the effects of individual drought events, there is still a knowledge gap regarding the cumulative consequences of repeated exposure to water scarcity and the influence of the timing of stress imposition. To address this gap, a field experiment was conducted to investigate the impacts of repeated drought stress on yield, berry composition, and the phenolic profile of grape berries. The results indicate that yield is primarily influenced by pre-veraison water deficit. Although the number of clusters was only slightly reduced, a substantial decrease in berry size was observed, resulting in a notable reduction in overall yield. The comparison between sun-exposed and shaded berries revealed an interplay between light exposure and water availability. Furthermore, pre-veraison drought stress resulted in a decrease in titratable acidity, leading to an increase of must pH at harvest time. These results emphasize the impact of early drought events on berry composition, persisting until harvest. This indicates the importance of maintaining optimal water supply during early growing season. The study suggests the potential to conserve water resources by strategically adjusting irrigation intensity during the late growing season.

Keywords: recurrent drought stress, berry quality, phenolic composition, yield, water saving strategies