Grape ripening delaying with combined use of leaf removal and natural shading in Manto negro (*Vitis vinifera* L.) under deficit irrigation

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The increasing frequency of heat waves during grape ripening presents challenges for the production of high-quality wine grapes. This underscores the significance of developing effective irrigation and canopy management techniques to optimize both yield and grape quality.

A field experiment was carried out during 2021 and 2022 using Manto negro wine grapes to study the effect of two irrigation strategies and different light exposure levels on grape quality. In a four-block experimental vineyard at Bodega Ribas in Mallorca, two irrigation treatments—moderate and severe deficit irrigation—were implemented. Within each irrigation plot, three light exposure treatments were randomly assigned, encompassing exposed clusters from pea size, non-exposed clusters, and shaded clusters after softening. Leaf area index and canopy porosity were assessed biweekly, and midday leaf water potential was measured weekly. Sensors for light and temperature were installed at the bunch level to quantify differences in bunch temperature and light intensity among treatments. The influence of irrigation and cluster light exposure on berry weight, TSS, TA, malic acid, tartaric acid, K+, and pH was analyzed at five points during grape ripening. Furthermore, the phenolic profile of grapes was analyzed at harvest in 2022. In the face of various heat waves, the natural shading technique reduced the maximum bunch temperature by approximately 10 °C compared to exposed bunches, regardless of the irrigation strategy. The combination of defoliation and shading techniques after softening led to a reduction in TSS at harvest and affected most quality parameters during the latter stages of ripening. This highlights an intriguing approach to delaying ripening in warm viticulture regions.

Keywords: shading, defoliation, grape ripening, irrigation, grape quality.

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