

Simulated climate change in a Mediterranean organic vineyard altered the plant physiology and decreased the vine production

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Abstract (250 words)

This study focuses on investigating the effects of climate change on the plant physiology and berries of *Vitis vinifera* cv “Monastrell” in a commercial vineyard managed organically in Southeastern Spain (Jumilla, Murcia). For this purpose, open top chambers and rainout shelters were employed to simulate warming (~2-7 °C, W) and rainfall reduction (~30%, RR) respectively. Additionally, a combination of both treatments (W+RR) was employed. Vines without either top chambers or rainout shelters were considered as control (C). The experiment was established in February of 2023. Predawn leaf water potential (measured using a pressure chamber), stomatal conductance (assessed with a porometer at mid-morning) and leaf chlorophyll and flavonoid content (measured using the Dualex® leaf clip sensor) were analyzed at veraison (5 months after the installation of structures). At harvest, the yield and dehydration rate of grapes were determined. The results revealed severe water stress (< -0.8 MPa) in all treatments, with a significant reduction in stomatal conductance in leaves of vines under the W+RR treatment. Moreover, warming treatments (W and W+RR) led to a significant decrease in flavonoid content. At harvest, grapes from the warming treatments resulted in a higher dehydration rate, showing a significant decrease in cluster weight compared to C and RR treatments. In conclusion, during the first year, treatments involving temperature increases and water restriction had a similar effect on the stress water indicators used; however, warming treatments induced a different metabolic response, influencing flavonoids and berries.

Keywords: Monastrell, open-top chambers, rainout shelters, organic farming.

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