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Título artículo: Canopy and soil thermal patterns to support water and heat stress management in vineyards

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RESUMEN: Row crops such as grapevine are particularly vulnerable to heat stress under hot and dry conditions due to the combined effect of soil heat fluxes and of limited capacity for leaf/canopy evaporative cooling via transpiration. Therefore, a better understanding of grapevine responses to variations in air and soil temperature and of related heat fluxes are required in Mediterranean-type viticulture in order to optimize canopy and soil management practices, while saving irrigation water. Ground based thermography was used to monitor canopy (TC)and soil (TS) temperature patterns in a vineyard trained in a vertical shoot positioning trellis system. Measurements of heat exchanges in the vineyard were done along the day and throughout the season to predict vine's water status and heat stress risks. Field trials were carried out in 2014 and 2015 in Alentejo winegrowing region (South Portugal) using two V. vinifera red varieties (Aragonez, syn. Tempranillo and Touriga Nacional) subjected to two deficit irrigation strategies. TC and TS measurements were complemented by punctual leaf and berry temperature measurements with thermocouples. Soil water content, leaf water potential and leaf gas exchange were also measured. TC was above the optimal temperature for leaf photosynthesis during a large part of the day (11:00-17:00 h), particularly under stressful atmospheric con- ditions (high VPD and irradiance) combined with lower soil water availability. The highest TC was measured at mid- late afternoon (17:00 h) indicating a delay relative to the highest Tair conditions. The basal part of the canopy (cluster zone) presented a temperature 1–2 °C higher than the upper part, whereas TS was on average 10–15 °C higher than TC. Variation in TS was coupled to sun radiation and TC correlated negatively with leaf water potential and stomatal conductance to water vapour. Our results suggest that TC can be used as a simple indicator of grapevine performance and as a parameter to feed grapevine growth models to estimate heat and water fluxes in irrigated vineyards. TS emerges as a thermal variable with potential use to manage heat and drought stress in vineyards.

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