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Diurnal evapotranspiration rate and canopy effects in short-term drought events in irrigated grapevines under different nutritional treatments

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Summary

The uncertain effects of climate change pose drought-related challenges in grapevine-producing regions. New adaptation measures to climate change through experimental research must be explored for grapevine production in drought-prone areas. Studies indicate that abundant fertilization with potassium aids against harmful drought effects during crop development. The objective of the present research is to evaluate the effects of actual evapotranspiration (ET_a) and leaf area index (LAI) under two short but severe drought stress periods considering potassium availability on grapevine (Vitis vinifera cv.). The study hypothesizes that abundant potassium levels enable grapevines' tolerance to drought periods, sustaining plant physiological development and improving yield under episodic drought stress. Data was collected using an experimental setup with weighing lysimeters under six treatments based on three potassium levels (concentrations in irrigation water: 5, 15 and 60 mg K^+ L^{-1}) and two irrigation regimes (well-watered and water-deficit). ET_a rate was calculated using the water balance method, and LAI was measured during the drought event among treatments. The results show that ET_a rates slightly vary during plant dehydration in the water deficit treatments, while had no differences during critical drought days. The ET_a rate patterns differed exceptionally between well-watered and water-deficit treatments during severe water stress days. During plant recovery, ET_a suffered a post-drought reduction without reaching similar values to well-watered treatments. Regarding LAI, drought significantly impacted plant canopy development, mainly in consecutive days of severe water stress. In sum, the study findings were against the proposed hypothesis.

Keywords: actual evapotranspiration, leaf area index, grapevine, weighing lysimeters