

ABSTRACT

Background and Aims: Potassium (K) fertilization is vital for grapevine growth and development, as well as for the quality and yield of grape berries. However, conducting experimental field studies to learn about the nutritional demand for K in table grapes can be challenging due to significant K storage in the soil. We examined the effects of various K application levels on two table grape cultivars: the early-bearing green “Early Sweet,” and the late-bearing red “Crimson,” for three consecutive seasons.

Methods and Results: Grapevines were grown in 500-L lysimeters filled with perlite and subjected to three K-fertigation treatments (15, 40, and 72 mg L⁻¹ K). The lowest K level resulted in improved K-use efficiency (> 80%) in both cultivars across the three seasons. However, this efficiency came at the cost of reduced vegetative growth, reflected by reduced leaf area index, and decreased pruning weight in “Early Sweet.” Stomatal conductance also declined under low K supply toward the end of the summer, underscoring this mineral’s (elemental nutrient’s) role in stomatal regulation. Together, these resulted in reduced daily water consumption. Low K supply resulted in lower fruit juice pH in the 2022 and 2023 seasons in “Crimson.” Conversely, elevated K-levels in 2023 and 2024 suppressed sugar accumulation in developing berries of both cultivars.

Conclusions: Varying K fertilizer levels significantly affected vegetative growth, physiological processes, and berry sugar content of early- and late-bearing table grape cultivars.

Significance of the Study: Optimization of K levels is essential for promoting growth, nutrient uptake, yield, and fruit quality in table grapes.