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Exploring grapevine water relations in the context of fruit growth at pre- and post-veraison

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Climate change is increasing the frequency of water deficit in many grape-growing regions. Grapevine varieties differ in their stomatal behavior during water deficit, and their ability to regulate water potential under dry soil conditions is commonly differentiated using the concept of isohydricity. It remains unclear whether stomatal behavior, water potential regulation, and the resulting degree of isohydricity has a relationship with changes to fruit growth during water deficit. This study was conducted on four varieties (`Cabernet Franc`, `Semillon`, `Grenache`, and `Riesling`) subjected to both short-term, severe water deficit and long-term, moderate water deficit applied at both pre- and post-veraison. Stomatal conductance was measured with a porometer, pre-dawn and mid-day stem water potentials with a Scholander-type pressure chamber, and fruit growth with a caliper. `Cabernet Franc` and `Riesling` exhibited a greater ability to maintain stomatal conductance, pre-dawn water potential, and mid-day water potential as compared to `Semillon` and `Grenache`. `Cabernet Franc` and `Riesling` were also more resistant to changes in fruit growth than `Semillon` and `Grenache` during both short- and long-term water deficit. Water deficit applied at pre-veraison had a larger impact on fruit growth than when applied at post-veraison. While we were not able to distinctly classify varieties based on common metrics of isohydricity, we found an association between the ability of varieties to maintain stomatal conductance and their ability to maintain fruit growth during water deficit.

Keywords: water deficit, fruit growth, stomata, water potential, isohydricity.