



Water stress induces changes in polyphenol concentration in Merlot grapes and wines

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- The purpose of this study was to evaluate the level of water application which optimizes phenolic composition. It was carried out in Friuli, Italy, in 1999, on a 6-yr old Merlot/SO4, cordon-trained, and planted on a gravelly loam. Two different water levels were compared: 1) **control (C)**, kept at 80% of soil available water, and 2) **stress (S)**, kept at 20% of soil available water. The amount of water applied was calculated based on the total humidity of the soil -this is the same as the total water-holding capacity. Irrigation was then applied every 15 days to meet the 80% and 20% humidity targets.
- Let's see what happened to the 1) physiological plant measurements, 2) berry weight, and 3) juice and wine composition. **Physiological plant measurements:** Water stress was not observed in the "stress" plants until the end of August. It was manifested as a **reduction in photosynthesis, transpiration, and stomatal conductance**. At harvest, water use efficiency was higher in the "stress" vines than in the control.
- **Berry weight.** Berry growth was significantly reduced in the "stress" plants at all sampling dates. The authors note that, even though berry sizes increased gradually throughout the season for both treatments, the values at harvest were lower than those of the previous sampling date (about 3 days earlier). That is, there was **berry dehydration** in the last several days before picking in both treatments.
- **Juice and wine composition.** 1) **Sugar** concentration was reduced in "stress" vines, but at harvest, the differences disappeared. 2) "Stress" vines had significantly lower **TA** and significantly higher **pH**. At this point, the authors note how these changes in both TA and pH actually had a minor impact on winemaking (5.6 versus 5.2 g/L TA; 3.6 versus 3.5 pH, for control and stress vines, respectively). The authors evaluated total phenols and anthocyanins spectrophotometrically. 3) At harvest, there was no significant difference in **total phenols**, but extractable **anthocyanins** were highest in the "stress" vines.
- How did all of this translate in the wine? The authors made small-scale wine (70 kg) in triplicate. *[This effort is commendable. How did we get away all this time with replications in the vineyards but not in the winemaking?]* During fermentation, the extraction of phenols and anthocyanins was very rapid at the beginning, and reached the highest levels after only 2 days. The wine from "stress" vines reached this peak later than control vines. **There was both a delay in extraction and a higher final level of anthocyanins and phenols in the "stress" vines.**

In conclusion, a level of 20% soil available water reduced the berry size and increased the berry anthocyanin concentrations at harvest. However, this did not result in an increase of anthocyanins in the wines. According to the authors, for water-stressed vines, the color extraction process during winemaking needs to be optimized to be able to take advantage of the higher pigment concentrations in the berries. [*The question remains "How so?"*] If you have access to this paper, check out the self-explanatory and very clear graphs.

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