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"Effects of restricted irrigation at different stages of development of Cabernet Sauvignon grapes on production and wine quality"

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• There seems to be agreement that controlled deficit irrigation 1) reduces vegetative growth, 2) increases cluster light exposure, and 3) improves wine quality through an increase of skin/pulp ratios and increased phenolic compounds. But, according to these authors, there have been some contradictory results regarding which phenological stage is the best to apply deficit irrigation. So the goal of this work was to compare deficit irrigation applied before and after veraison on vine performance and wine quality.

• The authors compared 4 treatments:

- **100% ET throughout the season**
- **40% ET throughout the season**
- **0% ET before verasion to 100% ET after veraison**
- **100% ET before veraison to 0% ET after veraison**

They used Cabernet Sauvignon vines growing at a research station in Santiago, Chile. The soil at the station is a sandy loam of alluvial origin, well drained. The authors monitored soil and water status, and measured yield components and wine composition for each of the treatments. The trial ran for 2 years (1994-95 and 1995-96).

• **Soil water potential**. The authors used tensiometers –placed 30 cm deep and 40 cm away from emitters- to measure soil *matric potential. [Matric potential is the main component of water potential in a soil, and it refers to the strength with which water is bound to the soil particles].* During those stages that received irrigation at 100% ET, matric potentials stayed at -10 to -15 kPa. In those stages that irrigation was suspended, matric potential became as negative as -75 kPa. (Results are nicely presented in a graph in the original text.)

• **Plant water potential**. The authors measured both pre-dawn leaf water potential and mid-day stem water potential. The measurements were well correlated in their trial. In general, vines without water deficit showed pre-dawn water potentials around -0.3 MPa. This value became -0.5 MPa when 40% ET was applied, and -0.9 MPa when irrigation was stopped altogether. (The equivalent values for mid-day stem water potentials were -1.0, -1.4, and -1.5 MPa, respectively). Interestingly, when irrigation was resumed after a long period of no irrigation, stem water potential values took 40 days to recover. The authors believe this delay may be associated with some root inactivation in the upper soil layers, or a strong decrease in soil hydraulic conductivity.

• **Yield**. 100% ET had the highest yield, 40% ET was intermediate, and 0% -100% and 100% - 0% had the lowest, with no significant differences between the two latter. In the first year, yield differences

were associated with cluster weight (cluster number across treatments was the same, since all treatments had been pruned to the same level). In contrast, in the second year, yield differences were associated with fewer clusters in the deficit irrigation treatments, since deficit irrigation (particularly in 0%ET - 100%ET) probably reduced floral induction.

• **Wine composition**. In both years, 100% ET - 0% ET reached the target Brix (22-23°B) 7 days ahead of the rest of the treatments. This treatment also had the highest wine TA. There were no differences in pH. Both *total phenols* and *anthocyanins* increased in all the water deficit treatments. The highest total phenol concentrations were found in the treatment with the water cut-off before veraison (0% ET - 100% ET), and the highest anthocyanin concentrations were in the treatment that had the cut-off after veraison (100% ET - 0% ET). Winemaking scale and/or protocol used are not mentioned.

• **Sensory evaluation**. The authors conducted triangular tests to see if there were differences across treatments, as well as across replications within each treatment. Because the triangle tests did not detect any differences, they used a random replication per treatment for further sensory evaluation. These additional triangle tests did not detect significant differences among the 3 treatments that had had water deficit. A panel of 8 winemakers then evaluated the wines for the following characteristics: global impression, visual color intensity, number of qualities, and number of defects. The panel found that the wine corresponding to 100% ET - 0% ET had the best overall impression and the least number of defects. [*Why this temptation to try to read specific sensory differences after a difference test declares there are none?*]

In conclusion, both the water deficit throughout the season and the complete water cut-off during part of the season, caused a decrease in *yield*, and an increase in *acidity* and *anthocyanins* in the wines. This effect was highest when the water cut-off took place after veraison (100% - 0%). The wines that had experienced some type of water deficit showed better overall sensory characteristics, compared to the full irrigation. The authors also concluded that it was the wine from the treatment with water cut-off after veraison that had the best sensory characteristics, even though this result seems inconsistent with the rest of the sensory data presented.

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