

## Characterization of phenolics and VOCs in wines obtained from Malbec vineyards of the Uco Valley submitted to high-altitude solar UV-B and water restriction.

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### Extended abstract

The Uco Valley, ca. 1100 m and 1500 m asl, is a high altitude grape growing area in Mendoza (Argentina) in which well reputed wines are produced. The drip-irrigated vineyards receive relatively high levels of solar ultraviolet (UV)-B during summer days (irradiances up to 0.40 W m<sup>-2</sup> at noon hours). Restriction in water supply (D) to the vines has become a usual practice to enhance fruit quality in many wine regions of the world, but little is known about their interaction with UV-B radiation. Abscisic acid (ABA) is a plant growth regulator that modulates many physiological and biochemical acclimation processes, some of them common to different stress conditions and/or environmental signals. It is known that ABA biosynthesis in grapevine is induced by D and high UV-B, and that ABA is involved in berries maturation. We previously analyzed at physiological and biochemical level the effects of UV-B, D, ABA applications and their combinations on vegetative growth and berry development of *Vitis vinifera* cv. Malbec. In the present work we aimed to continue the characterization of the Uco Valley region by assessing phenolics and volatile organic compounds (VOCs) in the wines obtained from grapevines of cv. Malbec in a high altitude vineyard (1450 m asl), and to evaluate the interaction of UV-B, D and ABA applications.

The experiment was carried out in a commercial high altitude vineyard (1450 m a.s.l., 69°15'37" W and 33°23'51" S), Gualtallary, Mendoza, Argentina. The UV-B treatments were given by filtering or not solar UV-B, i.e. covering the canopy with clear polyester (-UV-B) or low density polyethylene (+UV-B) from 15 days before flowering until harvest. The +UV-B and -UV-B treated grapevines were maintained at soil field capacity until veraison. From this point onwards half of the plants in each UV-B regimen were kept at field capacity (-D; well watered treatment), while in the other half irrigation was restricted until harvest (+D; moderate water deficit). The aerial part of plants was sprayed at veraison and repeated 15 days after with ABA (+ABA) or water (-ABA). In summary, a total of 8 combined treatments were performed. In the wine obtained of each combined treatment, low molecular weight phenolics (LMWP) and anthocyanins were determined by high performance liquid chromatography-multiple wavelength detector (HPLC-MWD); and VOCs were determined by solid-phase microextraction (SPME) coupled with capillary gas chromatography-electron impact mass spectrometry (GC-EIMS).

Wines from grapevines under +UV-B had a greater (17.2 %) content of LMWP than wines -UV-B, being quercetin the LMWP with the highest increase. UV-B interacted with ABA, where +UV-B and +ABA additively augmented polydatin. Also significant interactions between UV-B and D

were observed, in which wines +UV-B/+D presented the higher content (additive effect) for astilbin. Regarding resveratrol, a triple interaction amongst the three factors was observed, and the combination of +UV-B, +D and +ABA had a synergistic effect. Wines +ABA showed a marked increases of total anthocyanins (non-acylated, acetylated and p-coumaroylated forms), respect to –ABA wines. The anthocyanins peonidin and delphinidin were additively increased by +ABA and +UV-B. Twenty six VOCs were identified. Wines from berries +D (independently of combination with another factor) had a lower content of ethyl decanoate (30.7%), citronellol (18.2%), phenethyl alcohol (31.3%), nerolidol (37.7%), octanoic acid (47.5%) and ethyl pentadecanoate (67.7%) compared with –D wines. The esters isoamyl octanoate and succinate, and hexanoic acid were antagonistically affected by +UV-B and +D, in contrast, for ethyl lactate +UV-B and +D had a synergistic effect. ABA applications had poor modification on VOCs profile, comparing with phenolic profile.

In summary, D and ABA sprays can modify the effects of UV-B, being reflected in the phenolic and VOCs profile of the wines. Additionally, this work found that some effects of UV-B signal, previously observed in berries, remain in the wine obtained (mainly the high content of LMWP) and this effects cannot be replaced either by ABA applications or D.