



## **Cu, Zn and Mn uptake and redistribution in Cabernet Sauvignon grapes and wine: effect of soil metal content and plant vigor**

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This study investigated the influence of leaf thinning on micronutrient (Cu, Zn and Mn) uptake and distribution in grape tissues, in a 16 year-old Cabernet Sauvignon vineyard. The analysis was carried out in two plots with differences in vigor (P1- high and P2-low) grown in calcareous soils. Vigour was analysed by the NDVI values. In each plot, two treatments (with and without leaf thinning after bloom) were applied. Total and the CaCl<sub>2</sub>-DTPA extractable fraction of these micronutrients were evaluated. Nutrient concentration in petiole were evaluated from veraison to harvest as well as the concentration of those elements in seeds and skins at ripening and in wines elaborated with grapes grown in each plot and treatment in 2013. Their relationships were evaluated.

The soil extractable fraction did not give a good correlation with petiole concentrations. However, Mn in petiole was strongly correlated with soil total Mn. Cu and Zn had higher concentration at veraison than at harvest, while for Mn it was the opposite. Cu concentration in petiole and seeds was greater in the most vigorous plots, but there were not clear differences between treatments. Cu in seeds and skins correlated significantly but there was not correlation with Cu in petiole. Zn concentration in skins was quite similar in both plots, but with higher values in vines without leaf thinning. Zn concentrations in skins were correlated with Zn in petiole but no significant correlation was found with Zn in seeds. Higher concentrations were found in the no thinning treatment in skins. For Mn, petiole concentrations were greater in the high vigorous plot and in the leaf thinning treatment. However, petiole Zn concentrations were greater in the less vigorous plot and without clear effect of leaf thinning. Mn concentration in skins was greater in the less vigorous vines in both treatments and it was inversely correlated with Mn in seeds, but there were no significant correlation between them and Mn in petiole.

In wine, significant differences between both plots were found for Cu and Zn, with greater values in the most vigorous vines and with some differences in the wines elaborated with grapes from the leaf thinning treatment and without it. Cu levels in wine ranged between 0.78 and 0.96 mg/l in plot 1 and between 0.28 and 0.44 mg/L in plot 2, respectively for the areas with and without leaf thinning. For Zn, levels ranged between 0.76 and 0.74 in plot 1 and between 0.24 and 0.22 mg/L in plot 2. However, no differences were found between plots for Mn. Mn levels in wine ranged between 1 and 1.9 mg/L in plot 1 and between 1.12 and 1.2 mg/L in plot 2. This behavior was similar to that found in the skins and seed analysis.