Effect of soil particle size on vine water status, leaf abscisic acid content and berry quality in Nebbiolo grapes

Alessandra Ferrandino*[1], Antonio Carlomagno[2,3], Giorgio Ivaldi[2], Marco Vitali[2], Olga Kedrina[2], Davide Patono[1], Vittorino Novello[1], Claudio Lovisolo[1]

[1] -DISAFA – Università degli Studi di Torino, Largo Braccini 2, GRUGLIASCO (TO)

[2] – formerly DISAFA

[3] - Agriproject Group srl, Rutigliano (BA)

Email contact: alessandra.ferrandino@unito.it

AIM: We investigated the effect of soil texture on grapevine response to water stress, leaf abscisic acid concentration and berry quality, in two adjacent vineyards located in the renewed Cannubi hill of Barolo (Langhe area, CN, North-West Italy).

METHODS: The distance as the crow flies between the two Nebbiolo vineyards was about 250 m; cultural practices, rain, rootstocks (*V. berlandieri* x *V. riparia*), vine age were similar. The main difference between the two vineyards was the soil texture, one vineyard displaying a silty-loam soil where small dimension particles (69.4 %, clay + loam) were prevalent, with clay accounting for 18.3 % (high clay, HC), the other displaying a loam-soil, where small dimension particles were 48.2 % with clay at 14.4 % (low clay, LC). Photosynthesis, transpiration, stomatal conductance (gs) were assessed at three time points during the season by ADC Lc pro+ Photosynthesis System (Huddestone, UK) on 10 fully expanded mature leaf per plot. A Scholander pressure bomb was used for the Ψstem determination on 8 leaves. The free-ABA concentration was quantified in 3 mature and healthy leaves per plot (HPLC-DAD). On berries, we measured total soluble solids, anthocyanin concentration and profiles (HPLC-DAD), total flavonoids (Di Stefano and Cravero, 1991; Corona *et al.*, 2015) and total proanthocyanidins, spectrophotometrically (Harbertson *et al.*, 2015). The berry volatiles were assessed by SBSE-GC/MS (Ferrandino *et al.*, 2012).

RESULTS: The two vineyard soils showed different rates of drying speed, higher in LC respect to HC. Nebbiolo vines grown in HC soil tended to reduce the Nebbiolo cultivar anhisohydric behaviour, closing stomata at lower values of stomatal conductance, in line with the higher leaf ABA concentration respect to LC, after moderate water stress conditions (Ferrandino and Lovisolo, 2014; Tramontini *et al.*, 2014). At the berry level, this resulted in a significantly higher anthocyanin concentration since 15 days after véraison and in a higher percentage incidence of acylated anthocyanins. No major differences were found in total flavonoid and in total proanthocyanidin concentrations. However, as to these two last classes of compounds, further studies would be necessary as the spectrophotometric method used could have been not enough sensitive to allow the appreciation of differences. At harvest the concentration of non-C6 free-volatiles, particularly terpenes, was significantly higher in the grapes of the HC vineyard.

CONCLUSIONS: Soil particle size significantly influenced grapevine physiological performances and, consequently, berry quality. At a zonal scale, it is well known that soils with more clay, as the silty-loam HC vineyard, produce grapes giving high-structured wines, whereas sands (or the reduction of clay, such as the LC vineyard) produce less complex wines.

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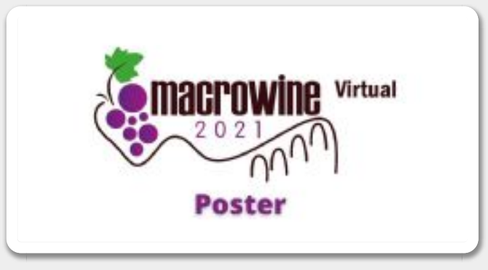

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