ECOPHYSIOLOGICAL RESPONSE TO ENVIRONMENTAL STRESS OF THREE WINEGRAPE GENOTYPES

L. de Palma[1], V. Novello[2] and L. Tarricone[3]

[1]*University of Foggia, DiSACD, Italy,* [2]*University of Turin, Colture Arboree, Via L da Vinci, 44, Grugliasco, TO, Italy,* [3]*CRA, Research Unit for Table Grapes and Viticulture in the Mediterranean Environment, Italy*

Email: vittorino.novello@unito.it

Background and Aims: Many studies have shown that the Earth's climate is subjected to a rapid rise in air temperature and decreased rainfall. In this context,differences between plant genotypes in their responses to warm and dry conditions are of great interest. Different genotypes have different strategies to endure these environmental stresses. They involve either stomatalor non-stomatal mechanisms to lower transpiration.

Nevertheless, these mechanisms reduce CO_2 assimilation. Hence, the relationship between net Carbohydrate fixation and stomatal conductance assumes great importance.

Methods and Results: In the semi-arid environment of Southern Italy, the physiological behaviours of three grapevine varieties were studied: the local cv. Nero di Troia, cv. Cabernet Sauvignon and the cross breeding Albarossa.

Pre-dawn and stem water potential, air VPD and leafgas exchange were measured at stages matching different environmental stress levels: vine flowering, postveraison,and pre-harvest. The Red : Far-red ratio (R : Fr ratio) of light incident on the interior-basal part of the foliage was measured as an indicator of canopy expansion. Measurements showed maximum stress at post-veraison.

At flowering, all cultivars showed good physiological performance. However, R : Fr ratio indicated a lower canopy expansion of Albarossa.

At post-veraison Nero di Troia had the lowest predawn and stem water potentials and greater degree of osmotic adjustment. Cabernet Sauvignon and Albarossa had the same water status. Leaf gas exchange was greatest early morning and thereafter stomatal conductance progressively decreased in all three varieties.

Nero di Troia and Cabernet Sauvignon had the same photosynthetic rates and Cabernet Sauvignon seemed to have a higher carboxylation efficiency under severe stress conditions. At pre-harvest during warm days stem water potentials were as negative as at post-veraison.

Albarossa had rate of stomatal conductance higher than Cabernet Sauvignon but maintained higher stem water potentials, possibly due to its lower canopy expansion. Leaf gas exchange was still active early morning, but was less than that during postveraison, possibly due to leaf aging or to down-regulation caused by the persisting stress conditions.

Conclusions: The local variety showed a tendency to most physiologically active, in contrast to Albarossa. Most of the physiological behaviours of Cabernet Sauvignon were sometimes close to Albarossa and sometimes close to Nero di Troia.

Significance of the Study: The 'intermediate' behaviour of Cabernet Sauvignon could explain the high adaptability of this 'international' cultivar to different environmental and growing conditions maintaining a good quality standard.