

Abstract

Plant Physiology and Biochemistry, **88**, 17-26 (2015)
dx.doi.org/10.1016/j.plaphy.2015.01.004

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Severe drought stress is affecting selected primary metabolites, polyphenols, and volatile metabolites in grapevine leaves (*Vitis vinifera* cv. Pinot noir).

Extreme weather conditions with prolonged dry periods and high temperatures as well as heavy rain events can severely influence grapevine physiology and grape quality. The present study evaluates the effects of severe drought stress on selected primary metabolites, polyphenols and volatile metabolites in grapevine leaves.

Among the 11 primary metabolites, 13 polyphenols and 95 volatiles which were analyzed, a significant discrimination between control and stressed plants of 7 primary metabolites, 11 polyphenols and 46 volatile metabolites was observed. As single parameters are usually not specific enough for the discrimination of control and stressed plants, an unsupervised (PCA) and a supervised (PLS-DA) multivariate approach were applied to combine results from different metabolic groups.

In a first step a selection of five metabolites, namely citric acid, glyceric acid, ribose, phenylacetaldehyde and 2-methylbutanal were used to establish a calibration model using PLS regression to predict the leaf water potential. The model was strong enough to assign a high number of plants correctly with a correlation of 0.83. The PLS-DA provides an interesting approach to combine data sets and to provide tools for the specific evaluation of physiological plant stresses.