Geophysical Research Abstracts
Vol. 18, EGU2016-8410, 2016
EGU General Assembly 2016

An innovative pot system for monitoring the effects of water stress on grapevines and grape quality

Sergio Puccioni (1), Marco Leprini (1), Stefano Mocali (2), Rita Perria (1), Simone Priori (2), Paolo Storchi (1), Alessandra Zombardo (1), and Edoardo Costantini (2)

(2) Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, CREA-ABP, Agrobiology and Pedology Research Centre, Firenze, Italy (edoardo.costantini@entecra.it), (1) Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, CREA-VIC, Research Unit of Viticulture, Arezzo, Italy

The advantage of a pot system is the possibility to control many variables and factors with a large number of replicates, obtaining statistically significant results in only one year of experimentation.
An innovative pot system for the monitoring of grapevine water stress was set up. The system consists of 99 pots of 70 liters, filled by 3 different soils collected from premium vineyards of the Chianti Classico district (Tuscany). The soils showed different texture (clay-loam, loam and sandy-loam), different gravel and carbonate content, and different available water capacity (AWC). The same soils had been field monitored for grapevine water stress; therefore it was possible to compare the grapevine behaviour both in pot and in field conditions.
The grapevine cultivar was Pinot noir clone ENTAV 115, which can be used to investigate the genetic expression in response to environmental factors, since its genome has been sequenced.
Different rootstocks theses were compared: not grafted, 1103 Paulsen and M101-14. Each combination rootstock-soil was repeated 9 times. Every pot was equipped for drip irrigation and with electrodes for soil moisture determination by TDR. A non-stop automated control unit recorded meteorological data (temperature and rainfalls), soil temperature and water potential on 9 selected pots. These 9 selected pots were also used to calibrate a model for soil water volume/tension curve. Soil, leaves and grapes samples from each pot were collected for microbial community determination, through NGS analysis.
A preliminary study was based on testing the ability of the system to simulate the natural growing conditions of the grapevines. Therefore the grape performances of the potted plants were compared to those of plants cultivated in the vineyards where the soils were taken.
In July 2015 three levels of water supply were tested during 5 weeks (up to veraison) in order to study the effects of water stress on the plants and the grape. Later, all the pots were irrigated abundantly until the full ripening of the grapes. The results revealed that a period of water stress during the early stages of bunches growth can induce irreversible changes in the physiology of the plant. Even if the leaf water potential was restored after abundant irrigations, the photosynthetic capacity was compromised, provoking remarkable effects on the composition of the grape. Although the plants produced similar amounts of grape, the water stress reduced the average berry weight. The plants with higher water availability synthesized more sugars and organic acids, while a strong water stress promoted the accumulation of anthocyanins and phenolic compounds. Soil typology and AWC influenced water stress and physiology of plants, and grape yield and quality. As expected, the plants grafted on 1103 Paulsen resulted more productive, while on the 110-14 they showed similar response to water stress that non-grafted vines. The results in the pots confirmed the effect of soil type that was monitored in the field, and highlighted a strong interaction between rootstock, soil, and microbial community.

Acknowledgements: Financial support for this project was provided by the Italy - Israel Cooperation in Agricultural Research.