

Effects of future climate change on grape and wine quality: a case study for the Aglianico grape, Campania. Italy.

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Water deficits limit yields and this is one of the negative aspects of climate change. However, this applies particularly when emphasis is on biomass production (e.g. for crops like maize, wheat, etc.) but not for plants where quality, not quantity is most relevant. For example, water stress occurring during specific phenological phases of grapevine development is an important factor when producing good quality wines. It induces, for example, the production of anthocyanins and aroma precursors. Water stress due to future increases of temperature and decreases of rainfall due to climate change can, therefore, represent an opportunity to increase winegrowers' incomes.

This study was carried out in Campania region (Southern Italy), an area well known for high quality wine production. Growth of the Aglianico grapevine cultivar, with a standard clone population on 1103 Paulsen rootstocks, was studied on two different types of soil: Calcisols and Cambisols occurring along a slope of 90 m length with 11% gradient.

The agro-hydrological model SWAP was calibrated and applied to estimate soil-plant water status at the various crop phenological phases for three vintages (2011-2013). Then, the Crop water stress index (CWSI), as estimated by the model, was related to physiological measurements (e.g. leaf water potential), grape bunches measurements (e.g. sugar content) and wine quality (e.g. tannins). For both soils, the correlation between measurements and CWSI were high (e.g. -0.97** with sugar; 0.895* with anthocyanins in the skins).

Next, the model was applied to future climate conditions (2021-2051) obtained from statistical downscaling of Global Circulation Models (AOGCM) in order to estimate the effect of the climate on CWSI and hence on vine quality. Results show that the effects of climate change on grape and wine quality are not expected to be significant for this particular grape variety when grown on these Calcisols and Cambisols. However, significant differences are found between the two soils in terms of ultra, standard and low quality grapes, which confirms the reliability of the terroir concept for the Calcisol. CWSI >15 values for the Calcisol indicate the potential benefits of drip irrigation which is, however, not allowed under current regulations.