



Drip-irrigation treatment of an autochthonous grapevine cultivar (*Vitis vinifera* L, cv Piediroso) at the footslope of Mount Vesuvius (southern Italy). Effects on grape enological characteristics and phenolic content.

Pasquale Ruocco¹, Carmine Amalfitano¹, Boris Basile¹, Roberto De Mascellis², Alessandro Mataffo¹, Andrea Matrone³, Mario Palladino¹, Carlo Perreca¹, Pasquale Scognamiglio¹, and **Simona Vingiani**^{1,4}

¹Department of Agricultural Sciences, University of Naples Federico II, 80055 Portici (NA), Italy

²Institute for Agriculture and Forestry Systems in the Mediterranean (ISAFoM), National Research Council, 80055 Portici (NA), Italy

³Cantine Matrone s.r.l., 80042 Boscotrecase (NA), Italy

⁴CRISP, Interdepartmental Center for the Earth Critical Zone, University of Naples Federico II, 80055 Portici (NA), Italy

The changing environmental constraints require even more adaptations of management techniques in agriculture and the qualitative improvement of wine production represents a sector of international strategic importance. Many wine-producing areas are located in environments currently suffering, or are expected to experience in the future, water deficits that can affect grape and wine quality. In the framework of the CISAV project (financed by the University of Naples Research Funding - FRA), three years of irrigation experiments (from 2021 to 2023) have been carried out on the autochthonous Piediroso' cultivar (*Vitis vinifera* sp) planted in a vineyard of volcanic environment, at the footslope of the Somma Vesuvius Complex (Campania Region, southern Italy), in temperate Mediterranean climate. The preliminary application of geophysical and radiometric proximal soil sensors (i.e., EMI and γ -ray) allowed to state the high homogeneity of the vineyard soils and the selection of adjacent zones where to conduct and monitor irrigated and non-irrigated control treatments. A non irrigated zone characterized by lava outcropping (lava zone - LZ) was monitored separately from the remaining control zone (not irrigated - NIZ) and the treated one (irrigated zone - IZ). Three soil profiles (one for each zone) were dug up to 120 cm of depth. Young, poorly developed, very deep, loamy sand, from slightly acid to neutral the pH, and deeply rooted are the soils. Soil properties suggest behavior as excessively drained and scarcely retaining water and nutrients for the plant supply. In the IZ, 50% of the calculated crop evapotranspiration (ETc) has been returned to the plants by drip irrigation system in post-veraison until harvest. By a meteorological point of view, 2022 was the year with the highest Huglin bioclimatic index (2768), the rainiest veraison-harvest period (206 mm) but also that with the highest calculated water deficit (-225 mm). Measures of midday stem water potential (MSWP) and stomatal conductance (gs) performed in pre- and post-veraison until harvest were consistent with an improved health status of the plants during the irrigation treatment over the 3 years, since the

MSWP and the gs of the IZ were always higher than those measured for the NIZ vines. The response of the grapevines in terms of grape quality parameters was compared between treatments and over the years. The irrigation treatment produced significantly different grape characteristics (i.e. berry weight and volume, total soluble solids content, pH, titratable acidity) and phenolic compounds content at harvest (i.e., anthocyanins, tannins and total phenols in skin and seeds), and significantly improved fruit yield, allowing the grapes to achieve the quality parameters required by the "Lacryma Christi del Vesuvio DOP" production protocol.