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Can the use of basalt dust mitigate the drought stress effects in grapevine? Setup of monitoring approach and protocols in a case study on Falanghina in Southern Italy

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In the inland of Southern Italy, climate change puts viticulture at risk of sustainability. Cultivar-specific cultivation techniques, also designed to suit peculiar pedoclimatic conditions of the vineyard, are needed to stabilize the productivity of vines, increase the grape quality, and improve the use efficiency of resources. Currently, the Italian legislation requires that vineyards are cultivated as rainfed to achieve quality and/or geographical indication labels. However, climate forecast models indicate that in the next decades there will be an increase in severity and duration of drought events that will affect the growth and productivity of vines beyond a threshold level making rainfed vineyards unsustainable.

The aim of this study was to verify whether foliar applications of basalt dust can mitigate the negative effects of drought stress in a vineyard of Falanghina grapevine in Southern Italy. The vineyard is in an inland area of Campania Region, at the premises of the La Guardiense farm, in Guardia Sanframondi, Benevento. A pedological survey, supported by a geophysical campaign, was performed to detect the soil spatial variability of the area and to identify the four subplots where the following treatments were imposed: 1) rainfed with the application of basalt powder on the leaf surface during the vine vegetative-productive cycle (i.e. from April to September); 2) rainfed,without distribution of basalt powder; 3) irrigated, with basalt powder; 4) irrigated, without basalt powder. The irrigation plan was defined weekly, applying a model considering precipitation and evapotranspiration, to reintegrate the water losses by transpiration. The growth and the ecophysiological traits of vines were monitored in the main phenological phases by measuring morphological parameters, fertility, leaf gas-exchanges, chlorophyll a fluorescence emission, leaf water potentials, and leaf anatomical characteristics, while the meteorological data and soil water content were collected through weather stations and time-domain reflectometry (TDR) technique. The production of each experimental plot was evaluated in terms of chemical characterization of musts and wines in order to assess the oenological potential. Specific attention was paid to the

setup of protocols for ecophysiological measurements to avoid bias and evidence the occurrence of possible photoprotection mechanisms. Results of the first year of experiments indicated the occurrence of interaction between the two main factors in a year particularly dry. The repetition of the experiments in the next years will allow us to unravel both the interference with climatic variability and the long-term effects due to the combination of factors.