DESIGNING AND MANAGING A SUSTAINABLE VINEYARD IN A CLIMATE CHANGE SCENARIO

Authors: Stefano PONI[1*], Tommaso FRIONI[1], Matteo GATTI[1]

[1] *Department of Sustainable Crop Production, Via Emilia Parmense 84, 29122, Piacenza, Italy*

*Corresponding author:*stefano.poni@unicatt.it*

Abstract:

Context and purpose of the study – Extension of the growing season, compression of the annual growth cycle and higher frequency and severity of weather extreme events are consistent features of global warming. While mitigation of factors causing global warming is necessary in the medium-long term, wine growers need "ready to go" adaptation practices to counteract negative effects bound to climate change. This must be done in a sustainably way, meaning that remunerative yield, desired grape quality, low production cost and environment friendly solutions must be effectively merged. In this work, we will review contribution given over the last two decades prioritizing issues related to scion and rootstock choice, changes in vineyard floor management, new perception related to the use of irrigation in vineyards, adaptation practices aimed at decompress maturity, solutions to counteract or minimize damages due to late frost and sunburn and, lastly, some hints on how precision viticulture can help with all of this.

Material and methods – Main tools and practices presented in this study will deal with: i) role of so called "minor" – too often neglected – cultivars; ii) testing of recently released drought tolerant rootstocks; iii) selection of new grass species for a more sustainable floor management and testing of the "mow and blow" and "rolling" techniques; iv) physiological and ICT based approaches to detect initial symptoms of water stress and testing of multi-purpose localized irrigation systems; v) techniques suited to de-synchronize sugars and phenolic maturity (e.g. apical to the clusters leaf removal); vi) potential to apply a double cropping mode even in a temperate climate; vii) a delayed winter pruning technique to escape or minimize late spring frost damages and viii) assessment of vineyard vigor mapping to increase vineyard efficiency and profitability.

Results – Under the aim of sparkling white grapes vinification, several minor, autochthonous genotypes were found having better acids retention at the same sugar level than standard commercial varieties, whereas the new M4 rootstock confirmed higher water use efficiency under drought vs traditional rootstocks. Termination in spring of a winter crop by slashing and moving of the sward under the row ("mow and blow") or rolling it to form a natural interrow mulching were remarkably effective to preserve water and to control native vegetation. Apical to the cluster late leaf removal confirmed to be reliable in several cultivars (Sangiovese, Barbera, Ortrugo) to delay sugar accumulation without hindering phenolic ripening. The double cropping technique, based on primary bud forcing triggered by severe shoot trimming and removal of the current laterals, was successfully trialed for two years in Pinot Noir: the forced crop was about 50% of the primary crop, it ripened about 45 days later and reached higher TSS, anthocyanins and, concurrently, maintained higher acidity. Late winter pruning performed in two steps in spurred cordons with finishing executed not later than two unfolded leaves grown on the still not shortened canes was able, under an array of conditions and cultivars, to postpone bud burst by about 15-20 therefore minimizing the risk to incur in frost damage; under several circumstances such delay was partially maintained until harvest. Finally, vigor mapping conducted even in tiny vineyards (i.e., less than 1 ha) has systematically disclosed high spatial variability which can be profitably exploited (e.g., selective mechanical harvesting) or corrected (e.g., variable rate fertilization).

Keywords: Grapevine, Global Warming, Ripening, Frost, Yield, Ripening Course.