Climate Change: A New Challenge for the Winemaking Sector

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Abstract: Viticulture and winemaking have a strong socio-economic importance worldwide. Weather and climate represent key forcing factors for grapevine development, yields, and quality. Hence, climate change is expected to pose a strong impact on this crop, threatening the sustainability of the winemaking sector. Recent-past trends show noticeable warming in the grapevine growing season, as well as changes in the precipitation patterns in many renowned winemaking regions worldwide. Furthermore, climate projections point to enhanced stress conditions for grapevine growth under future scenarios. The strong evidence for a significant warming and drying in the upcoming decades urges adaptation measures to be taken by the winemaking sector. The aim of this editorial is to provide an updated overview of the adaptation measures that can be used by sector stakeholders to mitigate the negative impacts of climate change. A recent review article, which highlights several adaptation strategies to ensure the future sustainability of this important sector, is hereby analyzed.

Keywords: viticulture; winemaking; climatic influence; climate change; adaptation measures

1. Introduction

Climate has a strong influence on grapevine (Vitis vinifera L.) growth [1], development [2], production [3], and quality [4]. Air temperatures, rainfall, and solar radiation are some of the most important atmospheric factors, which influence grapevine development. These factors also play a key role in the historical location of vineyards [5] and consequently on the local management practices and planted varieties. Weather variability, throughout the grapevine growing season, is also strongly tied to annual fluctuations in total production [3]. Additionally, extreme weather events, such as heatwaves, hail, frost, and floods, also have detrimental impacts on grapevine productivity and quality [6].

Given the importance of atmospheric factors on viticulture, climate change is a foreseeable challenge that the society will have to deal with in the coming decades. During the last century, significant increases in temperatures were found over the European winemaking regions, ranging 2 to 5 °C [7]. Moreover, changes in the precipitation patterns were also found [7] and the rate of occurrence of extreme weather events is also increasing [8]. These changes are expected to become even more evident under future higher anthropogenic greenhouse gas (GHG) forcing. According to the International Panel on Climate Change (IPCC), for different Representative Concentration Pathways (RCP), global temperature is expected to rise between 1 °C (RCP2.6—moderate scenario) and 5 °C (RCP8.5—severe scenario) over this century [9]. Higher temperatures during growing season should strongly affect grapevine growth [10], expecting to lead to earlier phenological events. Furthermore, high temperatures during maturation will most likely negatively affect wine quality and yields. Moreover, extreme heat and water stress, under future climates, may threaten grapevine productivity [11]. Given the abovementioned climate change impacts on this important crop, it is vital to plan and adopt proper adaptation measures.
2. Adaptation Measures against Climate Change

A recent review paper entitled “An Update on the Impact of Climate Change in Viticulture and Potential Adaptations” by van Leeuwen et al. [12] addresses the adaptation measures for viticulture under climate change. These authors divide the main adaptation measures into two clusters: adaptation to higher temperatures and adaptation to increased drought. In the first group, some specific adaptation measures are identified. The first adaptation mentioned involves using later ripening varieties [13], clones [14], and rootstocks [15]. The careful selection of the proper triplet combination (varieties/clones/rootstocks) will be crucial under future warmer conditions. Changes to some management practices may also show beneficial effects. The authors mention increasing the trunk height, reducing leaf area to fruit weight ratio [16], or applying late pruning [17] as proven adaptation measures to warm growing conditions. One more long-term solution may include relocating to higher altitudes zones [18]. Nonetheless, this is seen as a last resort measure since preserving the current vineyard location is a primary goal when adapting to climate change.

Regarding adaption to increased drought, these authors also suggest several adaptation measures. These measures mainly involve promoting a higher water use efficiency by using drought-resistant rootstocks [19] and varieties [20]. Another adaptation strategy involves modifying the current training systems to privilege systems such as goblet [18]. This traditional training system is currently used in regions under more severe drought conditions and may prove useful as a climate change adaptation strategy. Modifying the currently implemented management practices may also prove useful, by increasing row spacing [21] and increasing rooting depth. Finally, the authors mention an adaptation solution, i.e., the application of irrigation [11]. This controversial solution should be considered as a last resort, as water resources for irrigation are expected to become even scarcer in the future. It is worth also mentioning that the authors state that a combination of all these different adaptation measures may prove extremely useful [22] when mitigating the negative impacts of climate change.

3. Conclusions

The authors conclude that, although grapevines are well adapted to stress conditions, climate change may pose a major threat to winemakers in general. Nonetheless, the vast grapevine genetic diversity becomes a valuable resource and can be used as a powerful adaptation measure, allowing continuing to produce high-quality wines under future climates. Additionally, there are vast resources available for growers in terms of changing some of the current management practices, which may prove beneficial when adapting to climate change. It is imperative for growers and stakeholders to become aware of this problem in order to timely implement these measures. Additional research on this topic should become a priority within the winemaking sector to ensure the future sustainability of this important crop under future climatic conditions.

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