

Editorial

Phenolic Compounds in Wine

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Wine is probably the most popular and oldest human beverage. Highly desirable for its unique organoleptic and health-promoting properties, wine constitutes a rich source of phenolic compounds with strong antioxidant potential. Currently, there is mounting concern regarding the deleterious effects of global warming on grape quality and compositional profile. Indeed, in recent years, the winemaking industry has been seeking new ways to meet consumer needs while using agronomical practices that take better care of the environment and protect vines from extreme weather conditions.

Climate change is one of the main concerns presently affecting the agrifood system, general ecosystem and environment. In the specific case of the wine industry, climatic conditions can regulate the vegetative cycle of the vine spans and grape growth. This affects the general metabolism and culminates in alterations of macro- and micro-nutrients, as well as bioactive compounds such as phenolics. Phenolic compounds play pivotal roles in grape development. They can act as antioxidants, polymers involved in grape physiology and structure (lignin), attractants (flavonoids and carotenoids), UV screens (flavonoids), signal compounds (salicylic acid and flavonoids) and defense response chemicals (tannins and phytoalexins). In this context, the real functions of phenolic compounds in plant physiology and interactions with biotic and abiotic environments are difficult to overestimate. The Issue of *Beverages* entitled “Phenolic Compounds in Wine-Volume I” provides some evidence of the influence of adverse climatic conditions (low pluviosity and high temperatures) on the ripening evolution and phenolic content of red grapes from a vineyard in Alentejo (Portugal) between 2017 and 2018 [1]. During this study, the grape productivity was correlated to the rainfall, concluding in a direct relationship between the two variables. The lower rainfall was, the lower productivity became. It should be noted that despite high standards of pluviosity in the 2018 harvest, an event of extreme UV radiation occurred. This had a detrimental effect on grape quality and caused scalding to occur for further studies. Moreover, differences that depend on genetic factors were highlighted:

- ‘Trincadeira’ was the variety with the highest productivity;
- ‘Aragonês’ was the variety more affected by rainfall affecting the skin/pulp ratio;
- ‘Syrah’ had the smaller berries in both harvests, although with a higher skin-to-berry-weight ratio.

The results obtained thorough this study suggest that the weather may impact the grape growth, affecting the synthesis of secondary metabolites. Namely, anthocyanins and tannins reached higher values with lower rainfall and when under water stress conditions.

Monitoring phenolic compounds during growth and harvest periods and tracking the climate conditions give important information about the impact of different abiotic factors on grape quality. Likewise, genetic influence is analyzed by monitoring the effect of these factors on different grape varieties. To study the impact of weather on berries, it is essential to understand how wine quality compounds are affected in order to develop new strategies for mitigating or controlling climate effects on wine grapes. Likewise, grape



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composition will affect wine processing since phenolic compounds are directly related with the organoleptic properties of wine and wine stabilization.

In these unprecedented times, several urgent needs must be addressed on the way to designing a resilient, sustainable and efficient agrifood system. As mentioned, climate change can affect the grapes growth and plant metabolism. Plants usually react under certain abiotic and biotic stresses, altering the synthesis of secondary metabolites through the octadecanoid pathway to enhance the defense system, thus changing grape composition in phenolic compounds or methyl jasmonate. Methyl jasmonate is released from stressed plants into the air in order to transfer a stress signal to neighboring plants, which directly may induce their defense systems. Thus, the application of exogenous methyl jasmonate has been investigated as a promising treatment capable of increasing the contents of secondary metabolites in various plants. This Special Issue includes a study using the foliar application of the elicitor methyl jasmonate. This elicitor was tested as conventional and nanoparticle form and was evaluated in a tempranillo vineyard of La Rioja (Spain) over two seasons (2019–2020). In this time period, the latter were checked for their phenolic, nitrogen and volatile composition and sensory properties. It was found that although the total concentration of most of the groups of phenolic compounds was not altered in both years in the treated wines, the presence of several other phenolic compounds such as petunidin-3-glucoside, quercetin-3-glucoside, epigallocatechin, and most of the stilbenes did increase, producing wines that were more equilibrated in terms of both taste and odor quality [2]. When conjugated with urea, methyl jasmonate wines showed a higher content in terms of total amino acids than control wines without significant differences in volatile compounds being induced [3]. In parallel, the effect of nitrogen fertilization in the form of ammonium sulfate coupled with the nitrification inhibitor 3,4-dimethylpyrazole phosphate (DMPP) on the agronomic characteristics of grapes and wines of the white variety Savvatiano from a productive vineyard in the Attiki region was also assessed [4]. It was concluded that nitrogen fertilization and use of DMPP increased both productivity and yield simultaneously because the weight/berry was increased significantly. Other basic grape and wine characteristics were not affected.

Overall, this Special Issue focused on how the changing times in terms of both consumer values and climate shifts demand the adoption of more targeted and environmentally friendly agronomic solutions in the winemaking sector. Relevant information was highlighted from field to wineries in order to provide a comprehensive view of relevant scientific advances.

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