

Special Issue on New Frontiers in Wine Sciences

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Wine is a mark of cultural heritage, is an ancient and celebrated beverage, and is a global industry that is today valued at approximately USD 450 billion. Wine is the agricultural product with the highest added value; it has always been subject to advanced scientific investigations in order to better understand its complexity and help producers craft high-quality wine in challenging contexts. Nowadays, the wine sector is facing dramatic challenges such as climate change, sky-rocketing demand for unique and environmentally friendly wines with fewer intrants, and the extreme competitiveness of wine markets. Modern wine sciences must address these questions via multidisciplinary approaches that demand a wide range of scientific skills.

Therefore, this Special Issue, entitled “New Frontiers in Wine Sciences”, aims to compile a range of innovative studies addressing modern questions in the field of winemaking and wine quality through disciplines such as microbiology, chemistry, analytical chemistry, winemaking technology and sensory sciences.

Historically, oenology, or wine science, was born with modern microbiology and the studies of Louis Pasteur on fermentation. Logically, the field of microbiology inhabits a particular space in this Special Issue. Currently, one of the most popular topics in the field of wine microbiology is the study of the interactions between wine microorganisms. This question was firstly addressed by an investigation into the antagonistic interactions between relevant wine micro-organisms in order to improve wine quality management during fermentation [1]. This study, which is one of the first to focus on the interactions between non-saccharomyces yeast and lactic acid bacteria, reveals opportunities for novel solutions in the field of biocontrol. Biocontrol, which is the new hot topic in the field of wine microbiology, involves employing the properties of some microorganisms in order to avoid different types of spoilage. Among the most promising approaches in this field is the application of biocontrol techniques in order to significantly limit the use of sulfur dioxide (SO₂). Sulfur dioxide is undoubtedly the best preservative used in winemaking, but it is also of significant societal controversy and its utilization is becoming increasingly controlled. This topic was addressed by a work investigating the population dynamics and yeast diversity in early stages of making red wine without sulfur dioxide [2]. This work presents a promising approach to wine yeast identification and newly elucidates the interactions between microorganisms during the different maceration stages of red winemaking. Another topic that has recently garnered significant interest is the production of low-alcohol wine. Microbiologists have addressed this topic by investigating the use of particular micro-organisms and fermentation conditions in order to limit the production of ethanol. An original concept is presented here via the utilization of thermally dried immobilised Kefir cells for the production of quality low-alcohol wine [3]. With regard to wine quality and fermentation management, the control of yeast nutrition is crucial. In this context, lipids are particularly vital, but their measurement in yeast and grape juice can be



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challenging as it often requires some special equipment. Therefore, it is always fascinating to read a new publication addressing the quantification of fatty acids and sterols in yeast and grape juice, particularly when the method employs a common technology such as GC/MS [4].

Reducing pesticides in combination with climate change issues is a massive challenge for the wine industry. While the topic is generally tackled in the vineyard, some approaches also target the winemaking process by testing various fining agents in order to remove residual pesticides without stripping the qualitative wine compounds away. Therefore, any new proposal addressing this question is extremely relevant to the wine industry, even more so when the fining agent derives from plant material [5]. Besides environmental and societal questions, wine quality management and the understanding of wine uniqueness are also crucial. The first aspect of this topic is the understanding of the formation of off-flavours and the development of a product or methodology that will limit their presentation. The formation mechanisms of some wine off-flavours are well understood, but the restrictions advocated by society regarding the use of SO₂ elicit new challenges. Therefore, the development of novel processes, such as new types of filtration in order to remove off-flavours, is becoming increasingly vital to the wine industry [6]. On the other hand, the mechanisms implicated in the formation of some off-flavours, such as atypical ageing in white wine (ATA), remain poorly understood. A study presented in this Special Issue sheds new light on the topic, particularly investigating the role of metal ions and some oenological antioxidants in the formation of 2-aminoacetophenone, the main compound responsible for the ATA off-flavour [7]. Preventing wine from developing off-flavours is important, but better understanding the wine component at the root of a typical and unique sensory profile is another topic of high interest for the wine industry. Many studies have recently addressed this topic by characterising the chemical and sensory composition of wine profiles, but the literature on sparkling wine is limited. One of the studies presented in this Special Issue aimed to characterise the sensory profile of commercial prosecco wines, one of the most popular sparkling wines on the global market [8]. Finally, it is evident that the assessment of wine quality must be undertaken at a sensory level, but often the sensory quality is assessed in a very simple way, considering all the senses separately in a context quite far from the reality of wine consumption. In the conclusion of this Special Issue, you may find an interesting review of the existing literature on multisensory perceptions of wine experiences [9].

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