

Sulfite substitution by a mixture of winemaking by-product extracts and chitosan produces a new wine with higher nutritional value and acceptable sensory characteristics

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Statement of the Problem: The market for organic wines has experienced a notable expansion, resulting in a heightened demand for sulfite-free wines. This trend can be attributed to a growing customer preference for wines that do not include potentially hazardous substances but do include natural bioactive components that promote human health. Consequently, a plethora of research has been undertaken to evaluate the efficacy of alternative raw material in the winemaking process. Furthermore, the lack of supplementary sulfites has evolved from a fundamental characteristic used to differentiate wines to a crucial criterion for wines of exceptional quality. The aim of this study is to produce a sulfite-free wine with increased nutritional value by sulfite substitution with raw materials from the vineyard and the process of vinification.

Methodology: Nine (9) different wine making processes were conducted that involved the substitution of sulfites in winemaking with several raw materials, including chitosan, red grape (Augustiatis) pomace, and vine shoots coming from Augustiatis and small-berry muscatus of Samos, either alone or in combination. Alcohol, density, total sugars, total sulfites, lactic acid, malic acid, pH, total acidity and volatile acidity were all determined monthly for four months in all samples and volatile acidity was used as a spoilage index. total phenolic, anthocyanin's, catechins, tannins, flavonoids, flavanols, vanillic acid, a-viniferin, resveratrol, antioxidant activities based on ABTS, DPPH, FRAP, and CUPRAC, antiplatelet activity, human blood plasma oxidation inhibition and sensory evaluation were all measured at the non-spoilage experimental wine product and compared with the control sample.

Findings: the new sulfite-free produced wine compared to conventional wine with added sulfites had 7.0 times higher total phenolic, 8.8 times higher total anthocyanin's, 9.5 times higher total tannins, 8.2 times total flavonoids, 14.0 times higher total flavanols, 4.8 times higher vanillic acid, 1.6 times higher alpha- viniferine, 18.3, 19.5, 10.1, and 8.7 times higher antioxidant activities according to the ABTS, DPPH, FRAP and CUPRAC assays, 7.9 times higher resistance in human blood plasma oxidation based on the in vitro Cu²⁺-induced plasma oxidization assay and 2.5 times higher antiplatelet activity based on platelet activating factor (PAF) in platelet-rich plasma (PRP) inhibition assay.

Conclusion & Significance: The present study utilizing a combination of red grape (Augustiatis) pomace, vine shoots from small-berry Muscat of Samos and activated vinification chitosan led to the production of a sulfite-free wine which was preserved for 4 months at room temperature while at the same time exerted higher

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contents of natural bioactive constituents and higher bioactivities related to human health, presenting a higher nutritional value compared to the conventional wine with the addition of sulfites.

Biography

Haralabos C. Karantonis holds a degree in Chemistry from the University of Athens (1998). He earned his M. Sc. in Biochemistry (2000) and his PhD in Chemistry (2004) from the Department of Chemistry at the University of Athens. After a post doc at the (2005-2007) he joined the department of Nutrition and Dietetics at the Harokopio University (2004), serving as lecturer in Biochemistry (2004-2008). Since 2009 is a professor in Food Chemistry at the department of Food Science and Nutrition at the University of the Aegean. His Research interests are in Food Chemistry, Food analysis of bioactive molecules, and food formulation. He was/is leadership of 9 national research programs with a total budget of over 2 million Euros. He is a supervisor Ph.D. MSc Theses. He has served as Head of the Department of Food Science and Nutrition of the University of the Aegean for 4 years.