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Re-Use of Viticulture Waste: The Case of Unripe Grapes for the Development of New Vegetal Foods Enriched with Phenols

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Abstract

Unripe grapes (UG) discarded during thinning are an undervalued source of phenols which can be suitable ingredients for new functional foods. In developing phenol-enriched foods, temperature, pH and interactions of phenols with macronutrients of food can influence the chemical stability and antioxidant activity of phenol compounds. Moreover, astringency and sourness sensations could limit consumers' acceptability of these products. Interactions between phenols and macro-nutrients have been subjected to extensive studies. Nevertheless, chemical and sensory properties of vegetable foods enriched with UG phenols have not been investigated before. An UG phenol extract, obtained using a green solid-liquid extraction technique, was selected on the basis of its antioxidant activity. Three plant-based food models were used: carbohydrates/acidic pH/sweet - beetroot purée (BP), proteins/neutral pH/sweet - pea purée (PeP) and starch/neutral pH - potato purée (PoP). Phenols from UG were added at four concentrations (0.21, 0.44, 1.11 and 1.93 g/kg). The UG extract contained phenolic acid, flavanols, flavan-3-ols, procyanidins and trans-resveratrol and showed good stability during storage. Food models enriched with UG phenols showed differences in their chemical properties as a function of the amount of phenols added. The UG phenols recovered from the PoP and BP was averagely higher with respect to the amount recovered from PeP while the mean antioxidant activity detected in the BP (3,794 µmol TEAC/kg) was significantly higher than in the PoP (1,722 µmol TEAC/kg) and PeP (1,127 µmol TEAC/kg). The carbohydrates/acidic pH/sweet food model showed best health-promoting properties in term of both phenol recovery and antiradical scavenging. The main contribution of UG phenols to the sensory properties of the food models was sourness. Sweetness/sourness interactions were observed in the BP and PeP, resulting in a partial suppression of both the sour and sweet tastes. BP food model resulted more appropriate to counteract the impact of phenol on negative sensory properties. Liking slightly decreased with increasing concentration of phenols, even if all the samples were

considered acceptable by consumers. In conclusion, it was demonstrated that it is possible to find a good balance between health-promoting and sensory properties of the proposed functional food and the development of new phenol-enriched food using phenols from UG is a promising solution for the exploitation of this waste from viticulture.

Keywords: unripe grapes, phenols, functional food; food preferences

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