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Chemical and Nutritional Characterization of By-Products from the Wine Industry. Source of Healthy Ingredients for the Formulation of Nutraceuticals and Functional Foods †

F. Chamorro [1], P. Otero [1,2], M. Carpena [1], P. Garcia-Oliveira [1,2], A. G. Pereira [1,2], R. Perez-Gregorio [1,3], M. Fraga-Corral [1,2], Jianbo Xiao [1,4], J. Simal-Gandara [1,*] and M. A. Prieto [1,2,*]

[1] Nutrition and Bromatology Group, Department of Analytical and Food Chemistry, Faculty of Food Science and Technology, University of Vigo, Ourense Campus, E32004 Ourense, Spain
[2] Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolonia, 5300-253 Bragança, Portugal
[3] REQUIMTE/LAQV, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Rua Dr. António Bernardino de Almeida 431, 4200-072 Porto, Portugal
[4] International Joint Research Laboratory of Intelligent Agriculture and Agri-Products Processing, Jiangsu University, Zhenjiang, China
* Correspondence: jsimal@uvigo.es (J.S.-G.); mprieto@uvigo.es (M.A.P.)
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Abstract: The food industry generates large amounts of organic waste, which generally accumulates in landfills or is burned, causing environmental problems. However, many studies indicate that this waste is rich in bioactive compounds, so it could be revalued for transformation into high value-added products, thus favoring the circular and sustainable economy, reducing environmental impact and climate change. It is estimated that the wine industry (*Vitis vinifera* L.) produces up to 30% by weight of waste in relation to the material used, these include stems, skins, seeds and pomace, which are dietary sources rich in phenolic compounds, minerals, acids fatty acids and dietary fiber, which have shown beneficial activities for health, including antioxidant, antimicrobial, anti-inflammatory and even anticancer activities, both in vitro and in vivo. In this sense, a chemical characterization (minerals, phenolic compounds and fatty acid profile) was carried out in dehydrated and ground seeds of *Vitis vinifera* L., and in the oily extract, obtained by supercritical fluids (SCFE) at 20 MPa. The quantification of minerals was performed by inductively coupled plasma optical emission spectrometry (ICP-OES), the identification and quantification of the phenolic profile was performed by liquid chromatography-mass spectrometry (LC-MS/MS) and the profile of fatty acids it was studied by gas chromatography coupled to a flame ionization detector (GC-FID). The main minerals found were calcium, potassium and magnesium. Emphasizing the calcium 22.66 g/kg in the oily extract compared to the seeds 7.8 g/kg. Potassium concentration was 3.9 g/kg in seeds and 1.53 g/kg in the extract, while 1.4 g/kg and 0.59 g/kg of magnesium corresponded to seeds and extract, respectively. Regarding the polyphenol profile, the seeds mainly contain dihydroxybenzoic acid 42,580 mg/kg, catechin 81.05 mg/kg, quercetin 4856 mg/kg and resveratrol 1 mg/kg as main phenols, while the oily extract mainly presents oleacein 156,942 mg/kg, hydroxytyrosol 10,226 mg/kg and Tyrosol 8644 mg/kg. Additionally, a profile of healthy fatty acids was obtained, with polyunsaturated fatty acids (PUFAs) being the majority fraction 71.4%, highlighting oleic acids 16,868 mg/kg, and linoleic acid 82,606 mg/kg. The results obtained show that these by-products could be applied as part of the formulation of functional foods, nutraceuticals, and cosmetics, aimed at a broad population niche for the prevention of different diseases.

Keywords: *Vitis vinifera* L.; grape pomace; phytochemicals; bioactivity; extraction; food industry; pharmaceutical; phenolic compounds

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