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Effect of the Dehydration Process on Antioxidant Phenolic Content in Pedro Jiménez Grape Marc Flour

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Abstract

Grape pomace, the main byproduct of wine and pisco (grape brandy) production, consists of skins, seeds, and stems containing valuable bioactive compounds such as protein, dietary fibre, and antioxidants. While traditionally used for animal feed and soil amendment, it shows potential as a food ingredient. Because high moisture and sugar content promote microbial spoilage, reducing water activity is required, but the selection process must consider the heat-labile nature of the antioxidant compounds during processing and their potential for scaling up in flour production. This work aims to establish the effect of the dehydration process on the presence of antioxidant phenolic compounds during the production of flours from this raw material. Pedro Jiménez grape bagasse (white grape variety used for sweet wine and pisco production) was subjected to three distinct drying treatments: convective drying at 60 °C and 80 °C, infrared (IR) drying at 40 °C and 50 °C, and freeze-drying (control treatment). All samples were dried until the moisture content reached below 10%. Subsequently, dried samples were ground and extracted to analyse the soluble fraction. The following parameters were evaluated: Total Phenolic Compounds (TPC) using the Folin-Ciocalteu method, Flavonoid Content (FC) using the $AlCl_3$ colorimetric method, and antioxidant activity using the ORAC (Oxygen Radical Absorbance Capacity) assay. All results were expressed on a dry weight (DW) basis. The results show that the lower value of TPC was observed in samples dehydrated with the IR method at 40 °C, with 1494.2 ± 129.7 mg GAE/100 g DW; while the best result was observed in samples dried at 80 °C by the convective method, reaching 3219.5 ± 256.0 mg GAE/100 g DW, probably due to a slight hydrolysis of the material. Similar behaviour was observed for the FC content, yielding 520 mg QE/100 g DW. Regarding antioxidant activity, the best result was observed in samples dried at 50°C in an IR dryer, with 18222.4 ± 348.2 µmol TE/100 g DW, followed by samples dried at 80°C in a convective oven, with 15142.9 ± 107.3 µmol TE/100 g DW. In conclusion, the type of dehydration process, more than temperature as an independent variable, strongly affects the presence of bioactive compounds in white grape bagasse. Still, under high-temperature conditions (80°C, convective drying), the production of a floury ingredient from Pedro Jiménez grape marc that preserves antioxidant compounds was feasible.

Keywords: white grape marc, polyphenol extraction, dehydration processes

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