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Subcritical water for recovery of valuable bioactive compounds from kiwifruit processing by-products

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This study was designed to investigate the recovery of phenolic compounds from kiwifruit processing by-products using subcritical water extraction (SWE). SWE is a powerful technique has been shown to be a feasible option as a green extraction procedure for the functional bioactive. The effect of key operating conditions was determined by altering the extraction temperature (170–225°C), time (10–180 min) and pH (2, 10) under a constant high pressure (50 bar). The total phenolic and flavonoid contents, as well as the antioxidant capacity of extracts, were assessed using Folin-Ciocalteu assay, aluminum chloride colorimetric assay, 2,2-diphenyl-1-picrylhydrazyl radical scavenging assay (DPPH), 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonate) (ABTS) and ferric reducing antioxidant power (FRAP). To evaluate the feasibility of SWE technique the results were compared with those obtained using conventional solvent extraction and microwave-assisted extraction. High recovery of phenolic compounds (60.53 mg CAE/ g DW) was gained at 200 °C and extraction time of 90 min presented 20-, 15-, 7.5-fold higher value than ethanol, methanol (80%) and acetone (70%) extraction respectively. Besides, both SWE and MAE have demonstrated shorter extraction time and higher extraction yield, but MAE entails a higher economic cost. HPLC-DAD analysis was performed to identify individual phenolic compounds extracted under the optimum conditions (200°C/ 90min/ neutral pH) which protocatechuic acid, (+)-catechin, chlorogenic acid, p-coumaric acid, and caffeic acid were found to be the most abundant phenolic compounds. Furthermore, the formation of Maillard reaction products during SWE was investigated, and the content of 5-hydroxymethylfurfural (5-HMF) was determined using HPLC. The results exposed a potential formation of antioxidants from natural phenolic compounds under subcritical water conditions. The outcomes of this study indicated that subcritical water is an effective solvent to extract certain phenolic compounds and in many cases more advantageous than conventional techniques.

Biography

Hamid Kheirkhah received his Bachelor of Science degree in Agricultural Engineering from University of Mazandaran, Iran in 2005. He continued his study to complete Master of Science in Animal Nutrition in 2008 and Master of Science in Food Science at University of Reading, England in 2011. In 2015, he joined The University of Auckland as a PhD candidate. His research focuses on the extraction of valuable bioactive compounds using green extraction approach and production of value added products from food waste and food by products.

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