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PC-B10: Optimization of the ultrasound-assisted extraction of bioactive compounds from kiwi peel bio-waste: a path towards sustainable agri-food systems

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The study of fruit and vegetable bio-waste has aroused great interest, not only in the agri-food industry, for sustainability and economic reasons, but also among the scientific community, which has been highlighting this type of bio-waste material as an underutilized cheap source of bioactive compounds, namely phenolic compounds.¹ Kiwifruit is widely consumed worldwide and recognized for its beneficial characteristics for the consumer's nutrition and health.² However, the peel of this fruit is discarded as a worthless residue, although several studies report a very promising nutritional, phytochemical and bioactive composition.³ Therefore, this study was carried out to optimize the ultrasound-assisted extraction (UAE) of phenolic compounds from kiwi peel.

The processing time (1–45 min), ultrasonic power (5–500 W) and ethanol concentration (0–100%, v/v) were the independent variables combined in a five-level central composite design coupled with the response surface methodology (RSM) for process optimization. The levels of the phenolic compounds identified by HPLC-DAD-ESI/MSⁿ and the extraction yield of the obtained residue (or extract) were used as response criteria. The chromatographic analysis allowed identifying four phenolic compounds, namely two quercetin glycosides, one catechin isomer and one B-type (epi)catechin dimer. The constructed polynomial models were successfully fitted to the experimental data, statistically validated, and used to determine the optimal UAE conditions. The sonication of the kiwi peel sample for 15 min at 94 W (20 kHz), using 68% ethanol, resulted in 1.51 ± 0.04 mg of flavonoids per g of extract. These optimal processing conditions were applied to obtain a new extract, which allowed experimentally validating the predictive model. The kiwi peel extract obtained under optimized UAE conditions showed somehow promising bioactive properties, including antioxidant and antimicrobial effects, and no toxicity to Vero cells. Overall, this study contributes to the valorisation of kiwi peel as a low-cost raw material for the development of natural ingredients and also to the resource-use efficiency and circular bioeconomy.

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