

Recovering bioactive compounds from pineapple waste: a comparison between pressurized liquid and supercritical fluid extractions

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Pineapple is a popular fruit consumed worldwide. As a consequence of fruit processing, about 50% of the raw material becomes waste with high potential for recovery of bioactive compounds. In this perspective, this work aimed evaluating high pressure techniques (supercritical fluid extraction (SFE) and pressurized liquid extraction (PLE) to recovery bioactive compounds from pineapple waste. Pineapple waste was formed by peel and bagasse from juice processing. The SFE extractions were performed based on a full factorial experimental design with different levels of pressure (10, 20 and 30 MPa), temperature (40 and 60 °C) and percentage of co-solvent (5% and 15% w/w ethanol). On the other hand, PLE extractions were evaluated at different temperature levels (60, 80 and 100 °C) and ethanol percentage (50, 75 and 100% v/v). The extracts were evaluated for overall yield, phenolic compounds, flavonoid, carotenoid content and antioxidant activity. Then, overall extraction curves (OEC) were performed for the optimized conditions to understand the kinetic behavior of the extraction. It was observed that PLE had the highest overall yield of extract (38.7% w/w), phenolic compounds (9.39 ± 0.56 mg GAE/g RM dw), flavonoids (4.14 ± 0.45 mg EC/g RM dw), carotenoids (26.18 ± 1.04 μ g β -carotene/g RM dw) and antioxidant activity. This behavior occurs because PLE uses higher temperature, which increase the mass transfer coefficient. In addition, PLE requires a shorter extraction time and, consequently, there is less degradation of the compounds. Another possibility is that generally hydroalcoholic solutions are more efficient in solubilizing hydrophilic compounds than pure solvents. The determination of the global extraction curves showed that the PLE reaches the diffusional period in times less than 50 min, while the duration of the SFE was approximately 5 times longer for all compounds evaluated. Among the phenolics evaluated the SFE was able to selectively extract ferulic acid (60%) in the optimal extraction condition. Therefore, PLE proved to be the best technique for extracting bioactive compounds from pineapple waste when compared to SFE. In addition, the optimized operating condition showed that PLE is a more sustainable technique, with less time and energy demand.