OPTIMIZATION, KINETIC STUDY AND STABILITY OF THE GREEN EXTRACTION OF THE FLAVONOIDS FROM APPLE POMACE

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The polyphenols, bioactive compounds present in apples and its products, confer functional benefits and positive influence in the sensorial quality. However, during the apple juice processing about 42-58 % of these compounds, mainly the flavonoids class, are retained in the apple pomace. Therefore, the aim of this work was optimize, study the kinetics of the extraction process of the flavonoids from apple pomace using a hydroalcoholic solution as a possible application in foods and beverages and evaluate its stability. The extraction of phenolic compounds from apple pomace was performed using a Box-Behnken design in order to evaluate the effect of solvent concentration (40, 60 and 80 %), temperature (20, 35, 50 °C) and ratio solute/solvent (1:10, 1:20 and 1:30 w/v), during 20 minutes. The extracts were evaluated about the content of the total flavonoids, flavanols and flavonols, furthermore, was determined the antioxidant capacity DPPH, FRAP and ABTS methods. The multiple linear regression analysis coupled to response surface method (RSM) was able to defined the optimal conditions from the extraction process, suggesting be carried out using ethanol 60 %, at 50 °C, in ratio 1:20 (w/v). A kinetic study of flavonoids extraction was carried out in optimal conditions at temperatures of the 20, 35, and 50 °C during 240 minutes. Through the first order kinetic model was possible to define the equilibrate concentration for each temperature, being 2489.18, 2315.99 and 1695.48 mg CAT/kg for temperatures of the 50, 35 and 20 °C, respectively. The time necessary to achieve the equilibrium was approximately 50 minutes, independent of the temperature and the activation energy to transfer of the solute was 9.01 kJ/mol. The stability of the flavonoids was evaluated during 55 days at different temperatures (10, 20, 35 and 62 °C) and pHs (3.5, 4.5, 5.5 6.5). In general, the total flavonoids content remained constant in all temperatures in the pH 3.5. However, as pH increased, the flavonoids content decreased. The effect of pH on the compounds stability decreased at 10 °C. Therefore, the extract obtained in this work can be added mainly in acid foods and beverages, to improve antioxidant capacity and sensory quality.

Palavras-chave: RSM, bioactive compounds, antioxidant activity, by-products