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Optimisation of Supercritical CO_2 Extraction of Lycopene from Red Tomato

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Abstract

The supercritical fluid extraction work on tomato has been driven by the interest and opportunity to exploit these residues as a source of lycopene. Lycopene is a carotenoid with red color that can be applied as the food additive, cosmetic and pharmaceutical industries. In addition lycopene exhibits antioxidant features and some studies suggest this molecule is linked to anti-carcinogenic and anti-atherogenic effects [1,2].

The aim of this study was to optimize parameters for supercritical CO_2 extraction of lycopene from freeze dried red tomato pulp with skin. Response surface methodology using the central composite rotatetable design (CCRD) model was used. The total lycopene in the extracts was analysed by the reversed–phase HPLC method using a C_{30} column, with photodiode array detector. The CCRD consisting of three-factored factorial design with two levels was used in this study. The factors used were temperature of the extraction chamber (40 – 80 °C), pressure of the extraction fluid (200 – 550 bar) and duration (120 – 240 min). Coefficient of determination and the standard errors results from the analysis of variance have shown the model to be adequate. The linear and quadratic were 0.41 and 0.32, respectively. The independent variables have significantly ($p < 0.05$) influenced the extraction of total lycopene from tomato. A second-degree polynomial equation was developed from a response surface analysis for total lycopene yield and the highest yield was predicted at 60 °C, 55 MPa (550 bar).

Keywords: lycopene, supercritical fluid extraction, optimization.

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