

Abstract

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Title of Diploma Thesis: Development of Supercritical Fluid Extraction for Isolation of Biologically Active Substances

The main aim of this study was to optimize the method for extraction of quercetin – flavonoid with antioxidant activity – from dried crushed quince fruit (*Cydonia oblonga* Mill.) using supercritical fluid extraction (SFE).

The supercritical fluid extraction is a method in which supercritical fluid is used to extract active compounds. Neat CO₂ is the most common used solvent. Due to its physicochemical properties, it is suitable solvent for the extraction of non-polar compounds. While extraction of polar compounds is required, the organic solvents such as ethanol, methanol or isopropanol are added to the supercritical fluid. Depending on the amount of added organic solvent, SFE, SFE with modifier, CO₂ expanded liquid extraction and pressurized liquid extraction are distinguished. Temperature and pressure are other key parameters affecting extraction and need to be optimized as well.

The optimization of the quercetin extraction method was carried out in several following steps. First, the key parameters were tested using simple Plackett-Burman design of experiments where ethanol with 0–20 % water was chosen as green organic solvent added to CO₂ in ratio 10–90 %. The temperature was tested in the range of 30–80 °C and pressure in the range of 100–300 bar. The following step was a fully factorial design of experiments which is also focused on individual interactions between tested parameters. After its evaluation, optimized conditions were verified by several extractions. The kinetics of the extraction was tested for the flow rates 2, 3, 4, 5 mL/min. The repeatability of method (147.8 ng / 0.5 g sample, RSD 20.82 %) was verified for final conditions: the extraction time – 30 min, flow rate – 3 mL/min, temperature – 66 °C, pressure – 223 bar, extraction solvent – CO₂/ethanol + 10% H₂O (10/90, v/v). This method was used for the extraction of other South African plants that might contain quercetin just as quince.