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Evaluation of Cannabinoid Extraction from Cannabis Flowers Using Ohmic Heating

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Abstract

Background: *Cannabis sativa* has significant therapeutic potential, particularly for neurological disorders such as epilepsy, Alzheimer's disease, and Parkinson's disease, as well as for chronic pain and inflammation [1]. Despite its medicinal relevance, it is also consumed recreationally due to the psychoactive properties of Δ^9-tetrahydrocannabinol (Δ^9-THC) [1]. The extraction and analysis of cannabinoids is essential to support research and ensure the safety and regulation of cannabis-based products. Although several extraction methods have been explored, ohmic heating (OH) has recently emerged as an innovative and potentially more sustainable technique for extracting phytochemicals from plant matrices [2,3]. **Objective:** This study aims to develop an extraction protocol for cannabinoids using ohmic heating by quantifying Δ^9-THC, tetrahydrocannabinolic acid (Δ^9-THCA), and total Δ^9-THC. **Methods:** Dried cannabis flowers were pulverized in a Retsch Mixer Mill MM 400 equipped with steel balls (25 Hz, 12 cycles × 15 seconds). The OH extraction was performed using 80% ethanol and 20% water with added NaCl for 10 minutes. For the quantification, an Agilent 1260 Infinity II HPLC-DAD system was used, equipped with an InfinityLab Poroshell 120 EC-C18 (3.0 × 150 mm, 2.7 µm) column protected with a Poroshell 120 EC-C18 3.0 mm, 2.7 µm guard column. The gradient elution was performed using methanol with 0.05% formic acid and deionized water with 0.1% formic acid mixtures, with a flow rate of 0.5 mL/min, run time of 30 min, and injection volume of 5 µL [4]. **Results:** Several extraction parameters were studied to enhance the extraction of cannabinoids, namely the percentage of ethanol, extraction time and temperature. For an extraction period of 10 minutes, the highest total THC value was obtained using 80% ethanol (12.7%) compared to 40% (2.5 %). An increase in time and temperature (t = 20 minutes, 80 ºC) led to similar total Δ^9-THC extraction results (13.0%) even though the percentage of Δ^9-THC increased. **Conclusions:** The percentage of ethanol significantly influenced the quantity of total Δ^9-THC extracted. Increasing the extraction time did not affect the total Δ^9-THC extraction yield, although a higher degree of decarboxylation was observed.

Keywords: cannabis; metabolites; ohmic heating

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