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Extraction of *Dracocephalum Kotschy Boiss* using supercritical carbon dioxide: experimental and optimization

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ABSTRACT

Dracocephalum Kotschy Boiss was extracted using supercritical carbon dioxide (SC-CO₂) technique. In this work, the influence of pressure, temperature, flow rate and dynamic extraction time on the extraction yield of *Dracocephalum Kotschy*'s essential oil was investigated by response surface methodology (RSM). The obtained results showed that the data were adequately fitted into a second-order polynomial model. An RSM based on Central Composite Design (CCD) was employed to obtain the optimum conditions in terms of the significant parameters. Differential evolution (DE) methodology was also used to optimize the process parameters. The optimum extraction process parameters within the experimental range were found to be the pressure of 21 MPa, the temperature of 35 °C, the flow rate of 3.77 g/min, and the dynamic extraction time of 160 min. The maximum yield (0.9421%) obtained at the optimal conditions was more than that achieved by hydro-distillation method (0.7330%). Chemical compositions obtained from both methods were identified by GC-MS and determined by GC-FID. To the best of our knowledge, this is the first report on the extraction of essential oil from *Dracocephalum Kotschy* by the SC-CO₂ method.

Keywords: *Dracocephalum Kotschy Boiss*, Supercritical CO₂ extraction, Response surface methodology, Differential evolution, Optimization.

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