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Book of abstracts

28 Fevereiro - 2 Março
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This book contains the abstracts presented at the Second Iberian Meeting on Supercritical Fluids (2º Encuentro Ibérico de Fluidos Supercríticos/2º Encontro Ibérico de Fluidos Supercríticos), held in Coimbra – Portugal, on 28 February-2 March 2022.

Second Iberian Meeting on Supercritical Fluids
(2º Encuentro Ibérico de Fluidos Supercríticos/
2º Encontro Ibérico de Fluidos Supercríticos)

Book of Abstracts

Second Iberian Meeting on Supercritical Fluids
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Faculty of Sciences and Technology
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Contents

Oral Sessions

Scale-up of supercritical CO_2 extraction process for production of milk thistle extract

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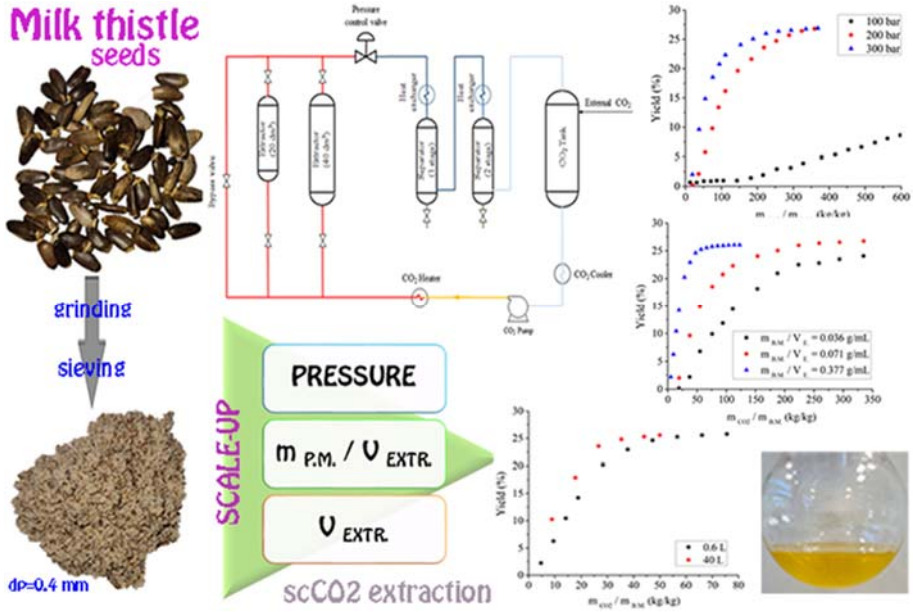
GRAPHICAL ABSTRACT



ABSTRACT

Milk thistle (*Silybum marianum*, Asteraceae) is a plant used in traditional medicine from ancient times mostly for treatment of liver disorders [1,2]. Nowadays it is an industrially valuable crop for preparation of herbal supplements reaching total sales of 16 million USD in the USA market [2]. The separation of valuable bioactive compounds from plant materials can be performed by several methods using organic and inorganic solvents. Nevertheless, supercritical fluid extraction (SFE) that employs CO_2 is considered a green alternative to other conventional extraction methods. In order to be economically viable, the SFE process should be optimized by selection of appropriate pressure and temperature conditions followed by a scale-up. The scale-up of the SFE process can be performed by keeping constant: the ratio of $scCO_2$ flow rate to mass of bed raw material, the ratio of bed length and bed diameter or dimensionless number such as Reynolds number [3]. This study presents the scale-up of the SFE process, first by selection of optimal pressure (100, 200 and 300 bar) at moderate temperature of 40 °C using a lab scale unit (0.6 L),

following by selection of optimal CO_2 consumption per used plant material as well as optimal ratio of plant material mass per volume of extractor. Optimal parameters were further tested using a semi-industrial scale unit (40 L). The highest extraction yield obtained was 27%. The performed scale-up study showed a good agreement between lab and pilot scale units. The qualitative analysis performed using GC/MS showed that obtained extracts contained around 80% of unsaturated fatty acids. The quantitative analysis performed using GC/FID confirmed that predominant fatty acids were oleic and linoleic acids with a content in the range of 191-234 mg/g and 445-514 mg/g, respectively (depending on the SFE pressure). Total phenolic compounds were estimated in each extract by the Folin–Ciocalteu assay reaching ca. 90 mg GAE/g. The free radical scavenging capacity was analyzed by the DPPH assay showing value of IC_{50} (concentration of extract required for the 50% decrease in absorbance of the blank) to be ca. 13 mg/mL.

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