Supplementary Material

Valorization of tomato residues by supercritical fluid extraction

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Introduction

In this article we present some unpublished work on the supercritical fluid extraction of tomato residues. Below we provide details on these experimental runs.

Materials and methods

Carbon dioxide (CO2, purity 99%) was supplied by Air Liquide (Algés, Portugal). Dichloromethane (purity 99.98%) and ethanol (purity 99.5%) were supplied by Fisher Scientific (Leicestershire, UK). Ethyl acetate (purity 99%) was supplied by VWR International (Fontenay-sous-Bois, France).

Tomato residues containing skins, seeds and tissues were provided by a local tomato processing facility in Portugal. The samples, which had an initial moisture content of 70.6 wt.%, were dried at 60 °C for 72 h in a forced convection oven. No further pretreatment was applied.

The supercritical fluid extraction runs were performed in a lab scale Spe-ed SFE unit, a model of Helix SFE System-Applied Separations, Inc. (Allentown, PA, USA) which is described in greater detail in previous works [1]. In each run, about 20 g of tomato residues were loaded into the extractor. The supercritical carbon dioxide at 300 bar and 60 °C flowed upwards through the extraction vessel at a constant flow rate of 12 g min^{-1} for 6 h. Extractions were performed using pure CO_2, CO_2 with 10 % ethanol and CO_2 with 10 % of ethyl acetate. The ethanol and ethyl acetate cosolvents were fed to the pre-heating vessel using a HPLC pump to modify the supercritical fluid polarity and the solubility of solutes.

The total extraction yield was determined according to the following equation:

$$\eta_{\text{total}} = \frac{m_{extract}}{m_{bio}} \times 100$$

where η_{total} is the total yield, $m_{extract}$ is the amount of extract, and m_{bio} is the amount of dry biomass loaded into the extractor.

Results

Table S1 lists the SFE runs conducted and the total yield obtained after 6 h. The highest yield was obtained using ethanol as cosolvent and the lowest using pure CO_2.

Table S1 – SFE experimental conditions and total yields obtained. Fixed conditions: 300 bar/60 °C/12 g min^{-1}/6 h.

Run	Cosolvent	Mass (g)	Total yield (%)
1	None	19.943	3.06
2	10 % ethanol	20.778	3.82
3	10 % of ethyl acetate	20.112	3.52

Figure S1 shows the extraction curves for the three experimental runs conducted. Fractions were collected at 30 min, 1 h, 2 h, 3 h, 4 h, and 6 h. It is visible that ethyl acetate, despite providing a lower total yield that ethanol, produces a faster extraction rate in the first 2 h.

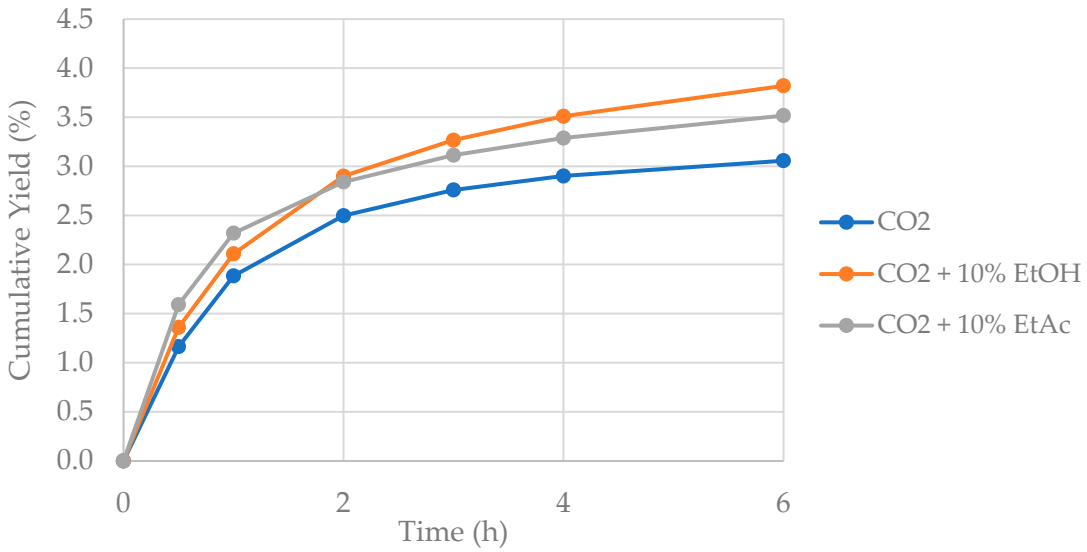

Figure S1 – Extraction curves of tomato residues using pure CO_2, CO_2 with 10 % ethanol (EtOH), and CO_2 with 10 % ethyl acetate (EtAc).

References

1. Rodrigues, V.H.; de Melo, M.M.R.; Portugal, I.; Silva, C.M. Extraction of Eucalyptus leaves using solvents of distinct polarity. Cluster analysis and extracts characterization. *J. Supercrit. Fluids* **2018**, *135*, 263–274, doi:10.1016/J.SUPFLU.2018.01.010.