cocoa-butter

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Cruising Review

Effect of Polar Cosolvents on Cocoa Butter Extraction using Supercritical Carbon Dioxide

This webpage QR code

Structured Data


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Cocoa butter, the fats and oils present in cocoa nibs, is an important ingredient in food, cosmetics, and pharmaceuticals.

PDF Version of the webpage (first pages)

Effect of Polar Cosolvents on Cocoa Butter Extraction using Supercritical Carbon Dioxide

1) Cocoa butter, the fats and oils present in cocoa nibs, is an important ingredient in food, cosmetics, and pharmaceuticals.
2) The primary methods of collecting the valuable oils have historically been, quote - mechanical expression and solvent extraction with hexane – unquote.
3) Mechanical expression involves physically pressing and squeezing the oil content out of the cocoa nibs.
4) A hexane solvent extraction uses hexane to dissolve the target oils out of the nibs before being separated from the hexane itself.
5) Recent concerns over the impurities introduced by mechanical expression and possible hydrocarbon contamination inherent with the hexane process has led to the development of Supercritical Carbon Dioxide Extraction (SC-CO2).
6) According to the author, SC-CO2 extraction, quote - offers the advantages of rapid, nontoxic, environmental-friendly, contamination-free, and easily manipulated conditions – unquote.
7) Controlling the temperature and pressure of the SC-CO2 environment can greatly affect the, quote - efficiency of the SFE process, which mainly depends on the solvent capacity – unquote, of the carbon dioxide.
8) This study investigates a third way to influence the efficiency of the Supercritical Fluid Extraction (SFE) process: the inclusion of a cosolvent.
9) Previous research has indicated that, quote – performing SFE procedure along with cosolvents usually results in higher extraction efficiency than that obtained by pure CO2 – unquote.
10) This trial sets out to compare the efficacy of three different cosolvents, used at different concentrations, to extract cocoa butter from cocoa nibs.
11) Specifically, acetone, isopropanol, and ethanol were tested at cosolvent concentrations of 5, 15, and 25 percent of the primary solvent (SC-CO2) weight.
12) Ethanol was the most promising cosolvent to test because it, quote – is commonly used as a cosolvent or modifier of the extraction of natural products because the toxicity of ethanol to the human body is low – unquote.
13) Additionally, ethanol is easily removed from the final product through distillation.
14) The extraction vessel parameters were held constant for all the trials: the pressure was held at 35MPa (5,076 psi), temperature was maintained at 60C (140F), and flowrate of 2mL/min. Extraction times ran for 16+ hours.
15) The most efficient of all trials involved the use of Ethanol as the cosolvent at a 25 percent concentration. This, quote – resulted in 100 percent extraction efficiency after 16 hours of extraction time – unquote. Tests employing Ethanol at lower concentrations resulted in lower extraction efficiencies given the same extraction time.
16) Acetone and isopropanol both showed significant increases in extraction efficiency with increased cosolvent concentrations, but not to the same extent as Ethanol.
17) The trials also showed that extractions with different cosolvents yielded slightly different extract compositions. Certain cosolvents yielded greater extract concentrations of certain triglycerides and fatty acids. Theoretically, cosolvents could be chosen for their extract selectivity.
18) Overall, the use of cosolvents was shown to have a significant positive effect on the efficiency of SC- CO2 extraction of cocoa butter. These results likely warrant the experimentation with regard to the effect of cosolvent on the extraction of other plant oils.

Publication: “Effects of polar cosolvents on cocoa butter extraction using supercritical carbon dioxide.”
E.K. Asep, S. Jinap, M.H.A. Jahurul, I.S.M. Zaidul, H. Singh. PDF. 2013.

Review by: SP

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