Characterization of *Copernicia prunifera seed oil* extracts obtained by supercritical fluid extraction

Buriti, M. S.^a; Pontes, P. V. A.^b; Fraga, S.^b; Sampaio, K. A.^b; Follegatti-Romero, L. A.^{a*}

^aUniversidade de São Paulo, Escola Politécnica, São Paulo, Brazil ^bUniversidade Estadual de Campinas, Campinas, Brazil *follegatti@usp.br

The Brazilian flora is recognized as the most biodiverse on earth and so much of its plants are still unknown or little studied. Copernicia prunifera (Mill.) H.E. Moore (Carnauba tree) is a native Brazilian palm from the Northeast region capable of surviving extreme weather conditions such as long periods of sunshine or flooding. Its exploitation is responsible for preserving native flora and reducing poverty in the countryside, employing about 200 thousand people during the year. The main commercial interest comes from its leaves responsible for producing carnauba wax, while its fruits are wasted or destined for animal feed. The oil contained in the seeds is a rich source of saturated fatty acids (mainly lauric acid) of medium-chain. This oil is similar to the coconut and palm kernel oils used exhaustively in the cosmetics industry once they are emollient and humectant. Vitamin E (tocopherols and tocotrienols) is also present. The most important chemical property of tocols is their antioxidant activity due to the capacity of protecting polyunsaturated lipids from oxidation. Traditionally, the Carnauba oil is extracted by pressing which promotes lower yield and solvent extraction that leaves traces of toxic solvents in the extract. Supercritical fluid extraction (SFE) using CO₂ as solvent works as an alternative method to obtain better guality edible oil having reasonable oil yield. In this study, seeds were separated from pulp then air dried and milled. Thus, supercritical extraction with carbon dioxide (SC-CO2) was used, as an alternative method, to extract bioactive compounds from seed and compared to Soxhlet extractions. The effects of pressure (20 MPa and 30 MPa) and temperature (313 K and 353 K) on global yield were investigated with average particle diameter (1.54 mm), CO₂ flow (2.5 x 10^{-4} kg/s) and a ratio between mass of solvent and mass of raw material (S/F = 54) kept constant initially. Subsequently, the best pressure and temperature yield condition (30 MPa/353 K) was used to study the effect of different S/F ratios (36 and 72) and a smaller average particle diameter (0.77 mm) on the composition. Finally, the obtained extracts were investigated in terms of fatty acid profile and quantity of bioactive compounds. The medium chain fatty acid (MCFA) profile was the highest in the largest mean particle diameter, S/F equal to 54, 353 K and 20 MPa. Increasing extraction time do not improve the concentration of MCFA in the extracts. Moreover, the temperature facilitates the concentration of MCFA while the pressure has a negative effect. Meanwhile, tocols content was maximum when S/F was held at 54, at 353 K and 30 MPa when particle size was bigger (354.94 mg/Kg seeds) and α -tocopherol was the most present isomer (269.77 mg/Kg seeds). β/γ -tocopherol content was found richer in Soxhlet extractions. α and β/γ -tocopherol content was reduced using smaller particle diameter. Presence of α tocotrienol was observed using larger particle diameter, 353 K and 30 MPa for S/F higher than 54. β/γ tocotrienol was also obtained in higher temperatures experiments (353 K). SFE method proved to be a good alternative to extract bioactive compounds from Carnauba seed when compared to Soxhlet extraction.

