Supercritical carbon dioxide ($scCO_2$) extraction of xanthones from *Garcinia mangostana* pericarp using virgin coconut oil (VCO) as additive

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Virgin coconut oil (VCO) as additive (co-extractant) to *Garcinia mangostana* pericarp (MP) for separating xanthones with supercritical carbon dioxide ($scCO_2$) extraction was studied. More than 13 experimental overall extraction curves were obtained at times up to 420 min at pressures up to 430 bar and temperatures up to 70 ^{o}C. Extraction of MP with 40% VCO co-extractant using $scCO_2$ at 430 bar and 70 ^{o}C gave *Garcinia mangostana* pericarp extract (MPE) that contained *α*-mangostin (32.2 mg/g), *γ*-mangostin (7.2 mg/g) and xanthones (28.2 mg/g), total phenolic content (33.9 mg gallic acid equivalent/g), and an extraction yield of 31 %, whereas, $scCO_2$ extractions of MP without VCO gave no extract. VCO is shown to promote xanthone mass transfer by dissolving the xanthone from the solid MP phase into the CO_2-saturated VCO liquid phase and transporting it into the $scCO_2$ phase as elucidated by analysis with the Pardo-Castaño model I (PC-I) and Broken and Intact Cell (BIC). The BIC model represented the overall extraction curves (OEC) well (R^2 = 0.9930, ARD 2.9%) with a constant extraction and falling extraction period of about 20 min and 100 min, respectively. Xanthones can be separated from *Garcinia mangostana* pericarp with VCO co-extractant and $scCO_2$ extraction without organic co-solvents. Both PC-I model and BIC model help to define extraction zones and the extraction mechanism.