

Microencapsulation of red palm oil as an oil-in-water emulsion with supercritical carbon dioxide solution-enhanced dispersion

ABSTRACT

Feasibility of microencapsulating red palm oil (RPO) with solution enhanced-dispersion by supercritical carbon dioxide (SEDS) without using high-temperatures or organic solvents was assessed. RPO prepared as oil-in-water (o/w) emulsion (11.7% RPO, 69.9% water, 3.5% sodium caseinate, 14.0% maltodextrin, 1.0% soy lecithin) could be encapsulated at all conditions (100–150 bar, 40–60 °C, feed injection flow rate 2.5 mL/min). Microcapsules produced with the SEDS method (125 bar, 50 °C, CO₂ feed 150 L/h) were flowable, spherical powders ($d = 5.8 \mu\text{m}$, $\sigma = 2.8 \mu\text{m}$) containing 31.6% oil with 92.1% ME, 82.7% RE for carotenes and 94.3% RE for vitamin E, whereas those from spray drying were irregular-shaped particles ($d = 16.6 \mu\text{m}$, $\sigma = 8.6 \mu\text{m}$) containing 39% oil, 79% ME, and having similar RE values. The SEDS method allows microencapsulation of food oils prepared as o/w emulsions without thermal stress or organic solvents.

Keyword: Red palm oil; scCO₂; SEDS; Particle formation; Microcapsule; Spray drying