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Production of essential orange oil emulsions by high pressure homogenization as a prior step for microencapsulation by spray drying

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Emulsification is one of the key steps in the microencapsulation of oils and flavors by spray drying. High pressure homogenization has been widely used to produce food emulsions by combining intense shear and turbulent flow conditions in order to promote droplets disruption. The objective of this work was to study the influence of total solid content (10 – 30%), oil concentration in relation to solids (10 – 30%) and homogenization pressure (0 – 1000 bar) on the emulsification of essential orange oil, aiming at obtaining stable emulsions that could be further subjected to microencapsulation by spray drying. A mixture of maltodextrin and whey protein concentrate (3:1) was used as wall material. Emulsions were first prepared by blending the oil and the wall solution in a rotor-stator blender at 14000 rpm during 5 minutes. Then, they were further emulsified using a high pressure homogenizer. The study was performed using a 2^3 central composite design and the emulsions were characterized for droplet size, creaming stability, rheological behavior and total oil content. As results, homogenization pressure was the variable that most affected droplets size. The increase in pressure up to 500 bar led to a reduction on droplet size, since the high energy promoted more intense droplets rupture. However, when higher pressures were used, the increase in the homogenization pressure resulted in larger droplets, probably as a consequence of the over-processing phenomenon, causing the droplets collision and coalescence. Emulsions were characterized as Newtonian fluids and viscosity was mainly affected by total solid content. With respect to total oil in the emulsions, the oil concentration was the variable that most affect this response – higher oil concentrations led to lower oil retention. High pressure homogenization showed to be an efficient technique that allowed the reduction of emulsions droplets size when moderate pressures were used.

Keywords: Emulsification, high pressure homogenization, droplet size.

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