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Effect of process parameters on the droplet size of flaxseed oil emulsions produced by cross flow membrane emulsification

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Emulsions play an important role on the food industry. A relatively new method called membrane emulsification has been extensively studied in the last years as an alternative to the conventional methods to produce emulsions due to its low energy consumption, narrower droplet size distribution and easy scale up. Flaxseed oil has been pointed as the richest vegetable source of ω-3 and ω-6 in nature and for that reason, there is an increasing interest by the food industry to use it as a food additive. The objective of this work was to evaluate the influence of process parameters (circulation velocity, applied pressure and emulsifier concentration) on the droplets mean diameter and polidispersity of flaxseed oil emulsions produced by membrane emulsification. An ultrafiltration α-alumina membrane with average pore size of 0.2μm was used for it. A 2^3 central composite design was used considering three factors (independent variables): continuous phase circulation velocity (3 to 8 m/s), pressure applied in the dispersed phase (1.5 to 4.5 bar) and concentration of the emulsifier Tween 20 (1 to 3 %w/w). The droplet size and its distribution were measured using a laser light diffraction instrument, Mastersizer S2000. Results showed that there was no significant difference neither on the droplet size and its distribution within the range chosen for the studied variables. The average droplet size obtained was 1.505 μm. However, some tendencies could be observed in the Pareto chart: the increase on pressure, in general, resulted in an increase of droplets size, while the increase on velocity resulted in smaller droplets. Membrane emulsification seems to be an adequate process to produce stable emulsions, showing monomodal distribution and requiring less amount of energy.

Keywords: Membrane emulsification, velocity, linseed oil.

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