

Abstract

Easy Surfactant-Free Emulsions and Drawings of Their Particle Size Distributions from Light Microscopy Images [†]

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Emulsions are an effective system for administering active compounds in humans. Regarding this topic, one of the challenges is to obtain surfactant-free emulsions using biocompatible stabilizers, such as chitosan, to avoid the use of conventional surfactants. Currently, most methods used to obtain average droplet sizes are based on techniques supported by high-cost equipment. Therefore, this study aimed to evaluate the dispersion of olive oil in an aqueous medium stabilized by chitosan, as well as to generate particle size distributions from light microscopy images and software (ImageJ v.1.50d and ORIGIN[®] 2019b). Briefly, olive oil and chitosan in acidic aqueous media were vortexed (3200 rpm); afterward, the samples were filtered through filter paper to obtain the final emulsions. Thus, emulsions with different oil-to-polymer ratios (1:5, 1:10, and 1:15) and different chitosan concentrations (5, 10, and 15 mg/mL) were prepared. To obtain particle sizes, images of emulsion samples at different storage times (1, 24, and 168 h) were acquired using an optical microscope and processed by Digital Image Analysis (DIA) with the ImageJ software. Particle size distributions were generated from different particle sizes of each sample, and their respective graphs were designed in the ORIGIN[®] software. As shown in the results, 5 min of stirring was a suitable time to obtain emulsions, and the filtration improved the homogeneity of droplet sizes. In addition, it was found that the higher the concentration of chitosan or oil, the greater the number of particles. After 1 h of preparation, particle sizes increased slightly with the chitosan concentration (e.g., from 1.37 to 1.62 μm). The emulsion with 10 mg/mL of polymer (1:10 oil-to-polymer ratio) remained stable for up to one week, irrespective of the type of chitosan. It was concluded that the proposed low-energy method led to the formation of stable surfactant-free emulsions, and particle size distributions can be generated using a free standard tool.



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