OPTIMIZATION OF OLIVE OIL NANOEMULSION USING HIGH AND LOW ENERGY PROCESS: HIGH PRESSURE HOMOGENIZATION AND D-PHASE EMULSIFICATION

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Introduction and Objectives: Olive oil (OL) shows extensive applicability in several fields, as well as in the preparation of nanoemulsion (NE) system for poorly water soluble or lipophilic compounds. However, vegetable oil provide challenge in the product development due to complex composition. Thus, a design of experiment (DOE) approach is important for obtaining optimized NE. This research aimed to optimize OLNE preparations by high pressure homogenization (HPH), and an unique alternative, D-phase emulsification (DPE), as high- and low-energy processes respectively.

Material and Methods: Material comprises oleth-20, olive oil, glycerin, carbomer and purified water. NE prepared by HPH method used piston-orifice type homogenizer. Preparation by DPE process was based on Endoo and Sagitani (1991) work, by dropwise addition of components under magnetic stirring. DOE approach was employed to evaluate the influence of process and composition variables on the NE mean particle size (MPS). The study was carried out by using Box-Behnken experiment. The preparations were kept in closed borosilicate glass vessels for 3 months stability test, at 4 and 25 °C.

Results and Conclusions: In HPH method, a 285.9±12.8 nm OLNE was successfully obtained. This process required one step Box-Behnken preparations to obtain a best fitting mathematical model. DPE enabled to obtain OLNE of similar MPS (278.2±10.2 nm) with same components composition as HPH. Posterior addition of carbomer seems not to influence MPS (305.9±12.6 nm and 328.8±11.9 nm, for HPH and DPE, respectively). Both carbomer based NEs were stable for 3 months. The advantage of DPE over HPH refers to the flexibility to prepare NE without specific equipment. However, DPE is more sensitive to the composition variation in the preparation than when using HPH.

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