DEVELOPMENT OF NANOSTRUCTURED-LIPID CARRIERS USING BIOSURFACTANTS FOR ENCAPSULATION OF VITAMINS

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Vitamins have an important role in human diet, being essential for normal maintenance, growth and development of human organism. Moreover, their absence can lead to specific deficiency syndromes [1]. Liposoluble vitamins exhibit poor solubility in aqueous mediums and are very sensitive and unstable when exposed to inadequate conditions (e.g. temperature and pH). With that in mind, it is important to preserve the properties of these molecules and to improve their biological efficiency. Nanoencapsulation can be an alternative and lipid-based nanosystems are presented to be a good alternative for vitamins encapsulation due to their unique features (e.g. easy scalability, presence of digestible lipids, possible absence of solvents and the use of food-grade materials during production) [2]. The main ingredients (i.e. lipids and surfactants) are important in their production and focusing in the food sector it is important to find new bio-based and biodegradable food-grade materials with new well-known properties, such as biosurfactants (produced by microorganisms) [3, 4]. The biosurfactants are already used in the food industry to improve, for example, texture, organoleptic properties and creaminess of products, this way and taking account their physico-chemical properties (low toxicity, high biodegradability, high selectivity, low micelle concentrations and effectiveness at extreme temperatures, pH's and salinities) the main objective of this work is the development and characterization of nanostructured-lipid carriers (NLC's) using biosurfactants for encapsulation of liposoluble vitamins. The NLC's were prepared by melt-emulsification, using ultra-homogenization followed by ultrasonication technique. For NLC's productions, Neobee 1053 (liquid lipid) and glycerol monosterate (solid lipid) were used as the lipid phase and rhamnolipids (biosurfactant produced by *Pseudomonas aeruginosa*) dissolved in ultra-pure water was used as the aqueous phase. A full factorial design was employed for optimization of the process, designing a set of experiments with different ratios of aqueous:lipid phases, solid:liquid lipids and concentration of rhamnolipids. Size and polydispersity (evaluated by dynamic light scattering, DLS) were used as response variables. Morphology of the NLC's system were further evaluated by transmission electron microscopy (TEM). Size (124-430 nm) was mainly dependent on the water content of the system, while the aqueous:lipid phase ratio and concentration of rhamnolipids were the main factors affecting the polydispersity, which ranged from 0.227 to 0.945. TEM observations confirmed the size determined by DLS and the spherical morphology of the NLC's. The results represent an important step for the encapsulation of vitamins and the consequent production of functional foods.

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