Stability of lipid nanoparticles encapsulating beta-carotene under different stress conditions


Nanoparticles have the ability to increase the bioavailability of lipophilic substances encapsulated within them and can be produced using low-energy approaches. These methods are extremely interesting because they are relatively simple to implement and demand low energy comparing to traditional high pressure processes. The low-energy methods most used are the phase inversion temperature and the spontaneous emulsification, which are based on the solubility change of nonionic polyethoxylated surfactant with temperature. The aim of this study was the encapsulation of beta-carotene in lipid nanoparticles of murumuru butter by a low-energy method (spontaneous emulsification), testing the influence of additives (NaCl, KCl, sorbitol) in their stability under environmental stresses. The production of nanoparticles consisted in dispersing a hot solution with 20% of surfactant in melted murumuru butter under mechanical stirring. Afterwards, the emulsion was subjected to two heating and cooling cycles. The particles were analyzed on day 0 and 5 to evaluate their stability in terms of average diameter and amount of beta-carotene. The values of pH tested were 3 and 8; the temperatures, 35°C and 75°C; the salt (NaCl) concentrations varied from 0.025 to 1M, and sugar (sucrose), from 1.5 to 15% (mass). On day zero all the particles showed diameters smaller than 55 nm. The particles with additives remained stable after tests with salt and sucrose, and under acid pH. All the samples remained stable after the tests under different temperatures. The results indicated the nanoparticles produced have a great potential to be used in a great variety of food formulations.