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P26: Influence of different types of bacterial nanocellulose on development of oil-in-water Pickering emulsions

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Abstract

Bacterial nanocelluloses have been studied to stabilize oil-in-water emulsions due to its ability to adsorb on the oil-water interface, promoting highly stable and surfactant-free systems. However, several features of the bacterial nanocellulose may influence the resultant emulsion, such as the cellulose nature, size, surface charge, shape and chemical surface. Thus, this work aims to produce sunflower oil-in-water emulsions using bacterial nanocelluloses produced by fermentation of *Komagataeibacter xylinus* in Hestrin e Schramm (HS) medium and processed by two different treatments: 2,2,6,6-tetramethyl-1-piperidinoxyl (TEMPO) mediated oxidation for the production of cellulose nanofibrils (CNF) and acid hydrolysis with sulfuric acid for the production of cellulose nanocrystals (CNC). The oxidized bacterial cellulose suspension was further nanofibrillated by high-speed homogenizer that produced the CNF (82 nm diameter and -46.5 mV surface charge). Nanocrystals had an average length of 491 nm, mean diameter of 70 nm and -50.3 mV of surface charge. For each nanocellulose, different o/w ratios were tested, in order to produce stable emulsions. The emulsions were formulated with an oil phase of 10-1% and an aqueous phase of 90-99%, with a nanocellulose concentration 0.5-1%. Different salt concentrations (NaCl) were tested in the aqueous phase (0-50 mM). The emulsion stability was evaluated by visual inspection considering that the absence of oil in the emulsion surface represents emulsion stability. Emulsions stabilized by CNC exhibited a mean droplet diameter varying between 1.2 and 2.0 µm, with a white color and fluid texture. On the other hand, the emulsions stabilized by CNF formed droplets above 2.0 µm with a less fluid texture, which confirmed the influence of the bacterial nanocellulose features on the characteristics of the emulsions formed. The microscopy analysis performed with polarized light demonstrated the presence of fibrils and crystals on the oil-water interface of the droplets. The oil droplets were also analysed by fluorescence microscopy after nile red staining. These results indicated that pickering emulsions composed by CNC and CNF, can be used as a carrier to encapsulate active compounds. Beta-carotene will be incorporated in the oil-in-water emulsions, as an hydrophobic model molecule, and digestibility studies will be performed to assess the beta-carotene bioaccessibility in different formulations.

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References

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