Production of microbeads using W/O emulsion gelation: An evaluation of different surfactants and water:oil ratio

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Abstract
Production of gelatin-alginate microcapsules by emulsion gelation was studied. Different surfactants (PGPR, Tween and SPAN) were tested in order to evaluate which emulsion provided the best particles after gelation. Moreover, the best oil concentration was also studied, aiming the reduction of the amount of waste during the process. Results showed that SPAN was the most appropriate surfactant, and that 1:3 W/O was the best proportion.

Key-words: microgel, emulsion, surfactant

Introduction

Bioactive compounds promote health benefits, but can be sensitive to adverse conditions, which can significantly reduce their viability. Gelatin-alginate microcapsules can be produced in order to protect these compounds. Among the existing techniques, microbeads formed by gelation of a W/O emulsion is a very simple and easy process but the oil used end up thrown away. The emulsion features will determine the proprieties of the particles produced. This study had the purpose of determining the best surfactant to produce the W/O emulsion, as well to assess the best oil concentration, aiming to reduce waste production.

Results and Discussion

Emulsions were produced using a mixture of alginate and gelatine, and soybean oil with 0.2% (w/w) of surfactant (PGPR, SPAN, TWEEN), using a rotor-stator system (UltraTurrax). PGPR was the surfactant, which led to the most significant superficial tension reduction (data not shown). However, it was not possible to obtain the microbeads with the PGPR emulsion, since it was not possible to separate the droplets after gelation.

Particles produced from emulsions prepared with SPAN showed the lowest polidispersity (Span) and particle size (Figure 1a). Thus, this surfactant was chosen as the most appropriate to prepare the emulsion.

The W/O phase relation in which the emulsion was prepared was also studied. The results showed that for larger amount of water, the particles produced had a higher polidispersity and size. The proportion that presented the best results was 1:3 W/O (Picture 2).

Conclusions

The production of microbeads through emulsion gelation, using SPAN as surfactant, produced spherical droplets, with low polidispersity. The best W/O ratio used to produce them also resulted in a decrease in oil use, reducing the amount of waste in the process.

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