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Evaluation of Folic Acid Release from Spray Dried Powder Particles of Pectin-Whey Protein Nano-capsules

Running title: Release of folic acid from nano-capsules

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Abstract

Our main goal was to evaluate release kinetics of nano-encapsulated folic acid within a double $W_1/O/W_2$ emulsion. First, W_1/O nano-emulsions loaded with folic acid were prepared and re-emulsified into an aqueous phase (W_2) containing single whey protein concentrate (WPC) layer or double layer complex of WPC-pectin to form $W_1/O/W_2$ emulsions. Final double emulsions were spray dried and their microstructure was analyzed in terms of scanning electron microscopy (SEM), and Fourier Transform Infrared spectroscopy (FTIR). Also the release trends of folic acid were determined and fitted with experimental models of zero and first order, Higuchi, and Hixson-Crowell. It was revealed that folic acid nano-capsules made with Span as the surfactant had the lowest release rate in acidic conditions (pH=4) and highest release in the alkaline conditions (pH=11). The best model fitting for folic acid release data was observed for single layer WPC encapsulated powders with the highest R^2 . Our FTIR data showed there was no chemical interaction between WPC and pectin in double layered capsules and based on SEM results, single WPC layered capsules resulted in smooth and uniform particles which by incorporating pectin, some wrinkles and shrinkage were found in the surface of spray dried powder particles.

Keywords: Release; Nano-encapsulation; Folic acid.

1. Introduction

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