

Accepted Manuscript

Process analysis and global optimization for the microencapsulation of phytosterols by spray drying

Carla Agustina Di Battista, Diana Constenla, María Verónica Ramírez Rigo, Juliana Piña

PII: S0032-5910(17)30651-4
DOI: doi:[10.1016/j.powtec.2017.08.008](https://doi.org/10.1016/j.powtec.2017.08.008)
Reference: PTEC 12747

To appear in: *Powder Technology*

Received date: 7 March 2017
Revised date: 19 July 2017
Accepted date: 6 August 2017



Please cite this article as: Carla Agustina Di Battista, Diana Constenla, María Verónica Ramírez Rigo, Juliana Piña, Process analysis and global optimization for the microencapsulation of phytosterols by spray drying, *Powder Technology* (2017), doi:[10.1016/j.powtec.2017.08.008](https://doi.org/10.1016/j.powtec.2017.08.008)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Process analysis and global optimization for the microencapsulation of phytosterols by spray drying

Carla Agustina Di Battista*¹, Diana Constenla¹, María Verónica Ramírez Rigo^{1,2}, Juliana Piña¹

¹Planta Piloto de Ingeniería Química, Departamento de Ingeniería Química, Universidad Nacional del Sur (UNS) – CONICET, Bahía Blanca, Argentina.

²Departamento de Biología, Bioquímica y Farmacia, Universidad Nacional del Sur (UNS), Bahía Blanca, Argentina.

*Corresponding author: Tel: (+54) 291-4861700 (290), e-mail: adibattista@plapiqui.edu.ar

Abstract

The response surface methodology (RSM) was used to optimize the microencapsulation of phytosterols by spray drying. The independent variables were drying air inlet temperature, atomization air flowrate, feed flowrate, phytosterols and total solids contents and the mass ratio between wall materials (Arabic gum and maltodextrin). The analyzed responses were process yield, mean volume particle size of product microparticles, phytosterols retention and encapsulation efficiency. Statistical analysis revealed that the selected independent variables, especially the atomization air flowrate and feed phytosterols content, significantly affect the studied responses. Taking into account the observed results and the analysis of variance, all the responses were successfully adjusted to second order models with interactions, showing good R^2 values and correlating the experimental data properly. The product microparticles were also obtained by using the predicted optimal operating and formulation variables to test the validity of the quadratic models. The experimental responses were found to be in agreement with the predicted values and were within the acceptable limits, indicating the suitability of the model for predicting key parameters related to process performance and product quality. The recommended optimal formulation and operating conditions for microencapsulation of phytosterols by spray drying are: drying air temperature of 160 °C, atomization air and feed flowrates of 498 L/h and 2.5 mL/min (equivalent to 42 mm of height of rotameter and 7 % pump scale, respectively), phytosterols and total solids concentrations of 2 and 15 g/100 mL, respectively, and mass ratio between Arabic gum and maltodextrin of 2.06. The process yield, encapsulation efficiency and phytosterols retention obtained under the optimum conditions were 84, 72 and 76 %, respectively. The product microparticles had a mean volume particle size of about 5 μm , well below the more restricted upper size limit of 25 μm required to guarantee the incorporation of PS into the intestine micellar phase.

1. Introduction

Phytosterols (PS) are vegetable sterols with a similar structure and functionality to cholesterol [1–3]. They are poorly absorbed into the blood stream [4,5], but are widely recognized as

Download English Version:

<https://daneshyari.com/en/article/4914788>

Download Persian Version:

<https://daneshyari.com/article/4914788>

[Daneshyari.com](https://daneshyari.com)