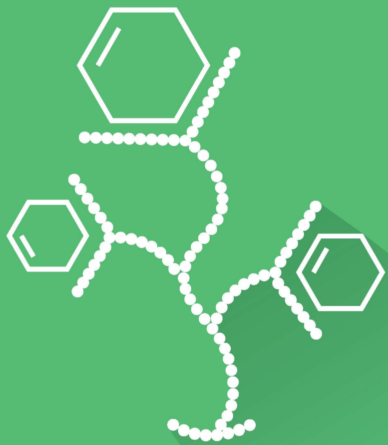

6th WORKSHOP
Green Chemistry and Nanotechnologies in Polymer Chemistry

July 15-17, 2015

Polytechnic Institute of Bragança | PCT-TMAD Brigantia EcoPark

Bragança · Portugal

WORKSHOP PROCEEDINGS

Eds. - M. F. Barreiro, O. Ferreira, A.I. Pereira

INSTITUTO POLITÉCNICO DE BRAGANÇA
LABORATÓRIO ASSOCIADO LSRE LCM
Brigantia EcoPark

Title
6th Workshop - Green Chemistry and Nanotechnologies in Polymer Chemistry

Edited by
M.F. Barreiro, O. Ferreira, A.I. Pereira

Graphic Design
Soraia Maduro - CIPweb IPB

First edition 07/2015
ISBN 978-972-745-188-3

Edition
Instituto Politécnico de Bragança

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Table of Contents

P37. MICROENCAPSULATION OF *Rosmarinus officinalis* L. (ROSEMARY) AQUEOUS EXTRACT FOR APPLICATION IN FUNCTIONAL FOODS

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Introduction

Rosmarinus officinalis L., commonly referred as rosemary, is native of the Mediterranean region being its leaf extracts normally used in traditional medicine. In particular, its phenolic extracts have been demonstrating hepatoprotective, antihyperglycemic, antiulcerogenic and antibacterial properties [1]. However, it should be highlighted that the bioactive compounds when exposed at adverse conditions (extreme pH, light, moisture, storage, food processing conditions) are generally prone to degradation leading to the consequent loss of bioactivity [2]. Thus, microencapsulation technology emerges as a suitable process by which the core material, enriched in bioactive compounds, is packed within the wall material to form capsules. This methodology helps, not only to protect functional compounds, such as polyphenols and other antioxidants, but also to ensure controlled release, or target deliver to a specific site [3]. In this work, a lyophilized rosemary aqueous extract prepared by infusion was microencapsulated and further incorporated in cottage cheese samples for new functional foods development.

Experimental

The bioactive compounds were extracted from dry leaves of rosemary (*Rosmarinus officinalis* L.) through an infusion process. The obtained extract was characterized in terms of antioxidant activity (free radicals scavenging activity, reducing power and lipid peroxidation inhibition) and the phenolic compounds profile evaluated by HPLC-DAD-ESI/MS. The microspheres were prepared by using an atomization/coagulation technique where a solution of sodium alginate containing the extract (10 mL, extract/sodium alginate ratio of 50/400 (mg/mg)) was atomized through a nozzle (0.35 mm) and coagulated in a calcium chloride solution (250 mL, 4% (v/v)). The forming microspheres were characterized by optical microscopy (OM) during the microencapsulation process to monitor morphology evolution. The encapsulation efficiency (EE) was evaluated by HPLC-DAD based on rosmarinic acid (the major extract's compound), and the effective incorporation in the alginate matrix verified by FTIR. Additionally, the free and the microencapsulated extracts were incorporated in cottage cheese samples that were thereafter characterized in terms of antioxidant activity and nutritional composition at two different storage times (0 and 7 days).

Results and discussion

The rosemary aqueous extract revealed high antioxidant activity (e.g. 73.44±0.54 µg/ml, according to DPPH test) and the main phenolic compound in its composition was a caffeic acid dimer, commonly named as rosmarinic acid. The extract also presented other caffeic acid derivatives, such as caffeic acid trimers and tetramers, the latter dimers of rosmarinic acid.
The microspheres with the prepared extract were evaluated during the encapsulation process by OM being observed that the largest microparticles showed round shape, while the smallest ones revealed a pear-type form. Nonetheless, in both cases it was observed the presence of small brown droplets that might correspond to the encapsulated extract (Figure 1 A and B, respectively). After lyophilisation (Figure 1 C), the microspheres showed a roughened surface due to the removal of the water in the lyophilisation process. The EE was determined trough an indirect method by quantifying the major compound of the extract (rosmarinic acid) present in the coagulation and washing solutions. Its absence in the analysed solutions let to estimate an EE around 100%. The FTIR analysis confirmed the presence

of the infusion extract inside the microspheres. In Figure 1D it can be observed the microspheres incorporated in the cottage cheese putting in evidence their maintenance after being subjected to the corresponding food processing.

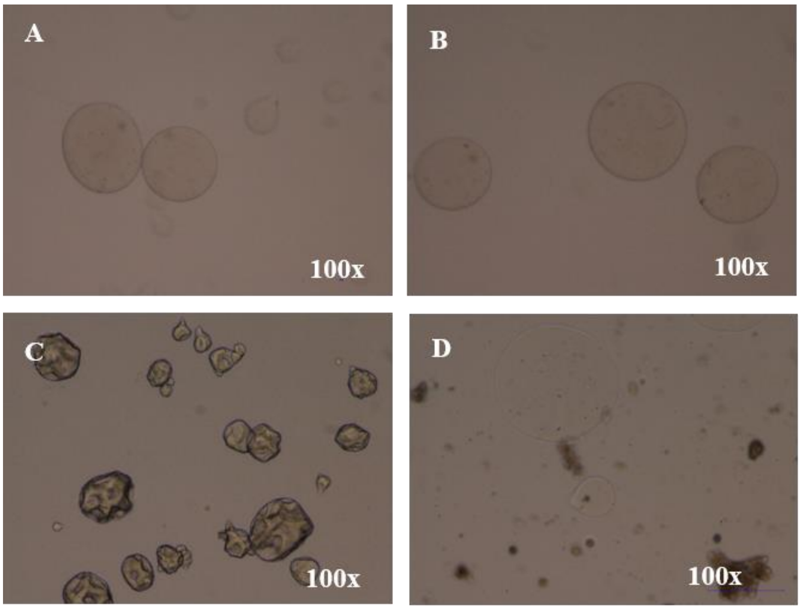

Fig. 1. OM analysis with magnifications of 100X. A – microspheres after atomization; B – microspheres after four hours in contact with solution of calcium chloride under stirring at 200 rpm; C – freeze-dried microspheres; D – microspheres incorporated in the cottage cheese.

Conclusions

The atomization/coagulation technique allowed the production of viable microspheres enriched with the natural extract. This final product was effectively incorporated into natural food matrices, specifically cottage cheese, protecting the infusion extract and allowing the development of novel functional foods. The characterization of the prepared cottage cheese samples (control, with free extract and with microencapsulated extract) is in course.

Acknowledgements

FCT for financial support to CIMO (Project PEst-OE/AGR/UI0690/2014). FCT/MEC and FEDER under Program PT2020 for financial support to LSRE(Project UID/EQU/50020/2013). QREN, ON2 and FEDER (NORTE-07-0124-FEDER-000014) and PRODER (Project nº 46577- PlantLact). The GIP-USAL to the Spanish Government through the Consolider-Ingenio 2010 Programme (FUN–C-FOOD, CSD2007-00063). L. Barros thanks FCT, POPH-QREN and FSE for her researcher contract under “Programa Compromisso com Ciência-2008”. The authors also thank Cantinho das Aromáticas Lda., for providing rosemary samples, and to Queijos Casa Matias, for the preparation of the cottage cheese samples.

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