Food Bioprocess Technol
DOI 10.1007/s11947-012-0880-z

ORIGINAL PAPER

Effect of Degritting of Phenolic Extract from Sour Cherry Pomace on Encapsulation Efficiency—Production of Nano-suspension

Alexandru Luca · Betul Cilek · Vasif Hasirci · Serpil Sahin · Gulum Sumnu

Received: 15 February 2012 / Accepted: 27 April 2012

Abstract The objective of this study was to study the influence of purification of sour cherry pomace extract on particle size distribution of suspension and on encapsulation efficiency of powders. In addition, antioxidant activity, surface morphology, and color of powder and capsules were determined. Extraction of phenolic compounds was performed at 30 °C with shaking at 70 rpm for 24 h with 1:20 solid–solvent ratio. Ethanol–water (1:1) was used as the solvent. Filtered extract was concentrated in a rotary evaporator and freeze dried to produce extracted phenolic powder (EPP). Purified extracted phenolic powder (PEPP) was obtained by degritting at 10,000 rpm for 2 min and then by freeze drying for 48 h. Purification reduced Sauter mean diameter ($D_{[32]}$) of concentrated extract from 5.76 μm to 0.41 μm. In encapsulation, two types of coating materials were used. The first one contained 10 % maltodextrin (MD) and 90 % distilled water, while the second one contained 8 % MD, 2 % gum arabic (GA), and 90 % distilled water. Samples were homogenized using ultrasound (160 W, 50 % pulse) for 20 min. Microsuspensions containing EPP had $D_{[32]}$ of 1.65 and 1.61 μm when 10 % MD and 8 % MD-2 % GA aqueous solutions were used for coating, respectively. It was possible to obtain nano-suspensions when purification step was performed. Suspensions prepared with PEPP and 10 % MD and 8 % MD–2 % GA for coating had $D_{[32]}$ of 0.396 and 0.334 μm, respectively. As a result of purification, encapsulation efficiency of the capsules increased significantly from 86.07–88.45 % to 98.01–98.29 % ($P<0.001$).

Keywords Encapsulation · Nano-suspension · Purification · Sour cherry pomace · Ultrasonication

A. Luca · B. Cilek · S. Sahin · G. Sumnu (✉)
Department of Food Engineering,
Middle East Technical University,
06800 Ankara, Turkey
e-mail: gulum@metu.edu.tr

V. Hasirci
Biomaterials and Tissue Engineering Research Center and
Department of Biological Sciences,
Middle East Technical University,
06800 Ankara, Turkey

Introduction

Fruits and vegetables are essential dietary sources. They undergo different processes at food factories in order to increase their shelf-life and accessibility to different geographical regions. As a result, a large variety of products are produced that may serve as alternatives to fresh fruits and vegetables. Juices are one type of these products. Pomace, which contains seeds, pulp, stems, and skin of the fruit, is generated as a byproduct of fruit juice production. Pomaces contain many natural antioxidants (Vattem and Shetty 2003; Ajila et al. 2011), including carotenoids, ascorbic acid, anthocyanins, flavanols, and flavonols (Garcia et al. 2009; Ruberto et al. 2007; Moure et al. 2001). Studies demonstrate that antioxidants from fruits and vegetables reduce the risk of cardiovascular diseases (Hu 2003; Scalbert et al. 2005) and certain types of cancer (Tamimi et al. 2005; Nkondjock et al. 2005).

The recent demand in nutraceutical and functional food production, cosmetics, and pharmaceutical industry is toward the replacement of synthetic antioxidants by the natural ones (Moure et al. 2001). The effectiveness of natural antioxidants extracted from pomace is dependent on storage stability, bioavailability, and bioactivity of phenolic content. Natural antioxidants are susceptible to spoilage during storage. In addition, direct usage of polyphenols is limited due to unpleasant taste of most of the phenolic compounds. The

Published online: 13 May 2012