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BioEcoUVa
The Institute of Bioeconomy of University of Valladolid

21st- 23rd March, Valladolid, SPAIN

2ND GREENERING INTERNATIONAL CONFERENCE

Valladolid (Spain), 21st to 23rd March 2023

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IMPACT OF BIOPOLYMERS USE ON PHYSICO-CHEMICAL STABILITY OF BLUE MAIZE EXTRACT MICROENCAPSULATES

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Blue maize is a rich source of anthocyanins which could demonstrate many beneficial effects on human health and the prevention of various diseases associated with oxidative stress. Cereal processing could generate a large amount of anthocyanins-rich waste products. However, anthocyanins incorporation into food is a technological challenge due to their low stability. The stability of these extracted valuable bioactive compounds from harmful environmental influences (oxygen, light, water) can be preserved by the encapsulation technique, which could entrap them inside a coating material. Microencapsulation technique could improve bioavailability, mask undesirable organoleptic characteristics of polyphenols and anthocyanins, making them more usable and represented in diet foods and as nutraceuticals. Spray drying process is one of the most widely used microencapsulation technique due to its simplicity, efficiency, and low operational costs. Nowadays, the accent is on the utilization of novel carrier agents with unique properties, such as hydroxypropyl-β-cyclodextrin-(HPBCD). The aim of the present research was to develop and examine microencapsulation systems of blue maize extract using a conventional biopolymer as a maltodextrin, in combination with a novel one, HPBCD, in order to obtain powders with appropriate organoleptic and pharmacological characteristics. The waste product of blue maize processing was used for anthocyanins extraction. Liquid blue maize extract was spray dried with and without adding carrier agents: MD (30%), HPBCD (30 %), and a combination of both carriers (15% MD and 15% HPBCD). The obtained spray-dried maize extracts (SME) were analyzed by the physico-chemical powder properties, particle size, Fourier-transform infrared analysis (FTIR), and differential scanning calorimetry (DSC), in order to examine preservation of blue maize extract. The diameter of spray-dried microparticles varied from 2.22 (d_{10}) for SME+MD to 257.14 μm (d_{90}) for SME+MD+HPBCD, respectively, with the mean average diameter d_{50} ranged from 4.72 to 21.33 μm for all microencapsulated powders. The encapsulation of the blue maize extract with carriers such as MD and HPBCD did not create meaningful changes, which is according to the literature indication for a successful microencapsulation process. Therefore, spray drying process did not change the structure of the polymer matrix and extract according to the FTIR analysis, indicating that the anthocyanins microencapsulation was developed by physical incorporation. DSC analysis signified that spray drying technique developed powders with high thermal stability and up to 200°C, related to the increasing stability with the addition of biopolymer material. The used biopolymers showed a good impact on the stability of microencapsulates of blue maize extract. Additionally, HPBCD provided an improvement in the physico-chemical characteristics of the powders.

Keywords: Blue maize, Waste, Microencapsulation, Spray drying, Characterization, Functional carriers.