biology and life sciences forum

MDPI

Abstract

The Thermal Characteristics of Coffee and Cocoa Powders Prepared by Freeze-Drying Process †

Rita Brzezińska [1,*], Ewa Ostrowska-Ligęza [1], Sylwia Kmieć [2] and Górska Agata [1]

[1] Department of Chemistry, Institute of Food Science, Warsaw University of Life Sciences—SGGW, 02-787 Warszawa, Poland; ewa_ostrowska_ligeza@sggw.edu.pl (E.O.-L.); agata_gorska@sggw.edu.pl (G.A.)
[2] SGGW; sylwiakmiec98@gmail.com
* Correspondence: rita_brzezinska@sggw.edu.pl
† Presented at the 3rd International Electronic Conference on Foods: Food, Microbiome, and Health—A Celebration of the 10th Anniversary of Foods' Impact on Our Wellbeing; Available online: https://foods2022.sciforum.net.

Abstract: The aim of this research was to evaluate thermal properties of cocoa and coffee freeze-dried powders. Medium roasted Arabica beans from Brasil and raw organic cocoa were selected to obtain the following freeze-dried powder variants: 100% coffee, 100% cocoa, 5% cocoa and 95% coffee, 20% cocoa and 80% coffee, 60% cocoa and 40% coffee. In order to characterise thermal behaviour of the freeze-dried powders, modulated differential scanning calorimetry (MDSC) and thermogravimetric analysis (TGA) in oxygen (O_2) and nitrogen (N_2) atmosphere were performed. Also water activity of prepared powder formulations was measured. It was noticed that freeze-drying process has significant influence on the thermal properties of generated cocoa and coffee lyophilisates. The use of MDSC allowed to determine the midpoint of glass transition temperature (T_g), which reached approximately from 48 °C to 60 °C. It was also observed that the values of T_g significantly depended on the level of water activity of the powders. TGA revealed that in both atmospheres the thermal decomposition of the freeze-dried powders occured in four stages. For all cases, the highest mass loss (50–60%) was registered in the temperature range (114 °C–400 °C). Furthermore, the weight loss rate of powders in the N_2 atmosphere was slower than in the O_2 atmosphere. All of the cocoa and coffee freeze-dried powders were detected with low water activity (below 0,3), what can be attributed to satisfactory microbiological safety of the tested samples. In conclusion, the authors of present study would like to emphasize that coffee powder with 20% cocoa addition could potentially be considered as a promising powder material in terms of thermal stability. This variant of obtained cocoa and coffee lyophilisates was characterized by the lowest water activity and the highest glass transition temperature.

Keywords: cocoa; coffee; lyophilisation; glass transition; modulated differential scanning calorimetry; thermogravimetry

Citation: Brzezińska, R.; Ostrowska-Ligęza, E.; Kmieć, S.; Agata, G. The Thermal Characteristics of Coffee and Cocoa Powders Prepared by Freeze-Drying Process. *Biol. Life Sci. Forum* **2022**, *2*, x. https://doi.org/10.3390/xxxxx
Published: date: 1 October 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.