ABSTRACT FOR PUBLIC

Authenticity of berry seed oils: the effect of extraction methods on thermal fingerprints studied by Differential Scanning Calorimetry and multivariate data analysis

Berry seed oil (BSO) is one of the valorised goods from berries by-products. Sustainable BSO production can support the circular economy implementation under the European Green Deal framework. The demand for BSO as food supplement, nutraceutical, and cosmetic products were observed in the recent years. Despite the growing interest, the consumer remains unprotected from possible fraud because there is no enforceable regulation to control the quality and the authenticity of BSO. Highly-valued edible oils are sold in different range of prices following the quality grades determined based on the physicochemical characteristics, oil-extraction method, and the raw materials (i.e. extra virgin oil, virgin oil, refined oil, pomace oil). However, no such quality grades were ever defined in BSO because the current knowledge about the quality controls are lacking.

In BSO production, cold-pressing, solvent, and supercritical CO_2 extraction are the common extraction methods to obtain the oil. It is worth noting that the usage of solvent is negatively impacting the environment. Minor difference in physicochemical properties found in cold-pressed and hexane extracted edible oils also gives the possibility for greenwashing and other fraudulent activities to the manufacturer. Greenwashing is an immoral marketing strategy claiming about the environmental consciousness without genuinely taking a significant step towards sustainability. To tackle these problems, studies about the characteristics of BSO obtained from different oil-gaining procedures are necessary to be conducted.

The main goal of this study is to investigate the authenticity of berry seed oils (raspberry, blackcurrant, strawberry) obtained from different extraction methods (cold-pressing, solvent, supercritical CO_2 extraction) using Differential Scanning Calorimetry (DSC) and multivariate data analysis. The proposed study will be focusing on the thermal characterization of BSO due to the potential usage of DSC to assess oil's authenticity based on the thermal fingerprints. In food study, thermal fingerprints are able to give the information about the processing history on food matrix. Thermal fingerprints also can point out the general composition changes due to the frauds. Additionally, proper chemometrics techniques will be utilized to maximize the thermal data interpretation and statistical model for characteristic prediction.

The pioneering nature of this project focuses on the effort to utilise DSC as an authenticity instrument for berry seed oil. **Expanding the utilisation of DSC will benefit the industrial laboratories which does not have any access to specific instruments dedicated for authenticity assessment. The knowledge obtained from the proposed study will be a fundamental approach for food policy makers to build the regulatory standards for berry seed oils**. To conclude, this research work supports the circular economy implementation by expanding the knowledge about green technology and by-products valorisation to reach the long-term European Grean Deal's goal.