Rapid Test for controlling the Quality and Integrity of Probiotic-Based Products

Hary RAZAFINDRALAMBO [1, 2]
[1] e-Laboratory of Multidisciplinary Science and Technology Abreast, BELGIUM
Email: hlh_r@mail.com
[2] Gembloux Agro-Bio Tech, University of Liege, BELGIUM
Email: h.razafindralambo@uliege.be

ABSTRACT

Probiotic-based products, including functional ingredients, fermented foods, and diet supplements, are today widely distributed in the market, owing to their recognized promoting effects on the human, animal and plant health. However, such products are much more complex than we believe, based mainly on the living state and specificity of each microorganism strain used for their formulation. It is therefore not surprising to encounter a variability in the commercialized probiotic product quality and performance from various manufacturers and different countries, even for the same formulation brands. Consequently, it is highly expected to develop and validate a rapid standard test of quality and integrity control for probiotic-based products in order to guarantee the same performance and authenticity before their use. A thermal profiling and fingerprint generating method using a coupling thermogravimetry - differential scanning calorimetry (TGA-DSC) responds to this goal, which is the main purpose of the present communication. This calorimetric coupling technique has been recently used for the first time as a fingerprinting tool for probiotic-based powder products [1]. Such original approach provides unique qualitative and quantitative data related to the decomposition and transition phases for each probiotic powder sample, whatever its complexity, by monitoring the changes in the material mass and energetic content under a constant temperature rise with well defined conditions. This new method has a lot of advantages compared to the gold standard ones such as phenotypage and genotypage techniques for the quality control and authentication of probiotic products. It reveals not only the probiotic strain features but also those of the other functional ingredients (e.g. cryoprotectors, antioxidants, etc.) added into the formulation. In fact, these additional ingredients can also contribute to the functionality and performance of the product. In addition, the method is rapid, highly reproducible, sensitive, adaptable to a high throughput analysis, and requires only a small amount of sample without pretreatment. Its potential validity has been shown by a comparative analysis using proteomics and in vivo test of intestinal permeability [2], and inter laboratory analyses performed on a multi-strain probiotic sample reference. Besides the pure analytical aspects, this method can also provide some relevant fundamental information on the thermostability of the probiotic strains. More than 100 products containing, either mono-strain or multi-strain formulations, and pure strain samples, have been tested with this method, and each sample shows a unique qualitative profile and significant different quantitative thermophysical data. Comparative analyses with other techniques and database creation are among the future investigations to be conducted in such a promising quality and integrity control approach, which is also valuable for other food and non food products.

References

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