

## Use of Encapsulated *B. lactis* through Freeze-Drying and Extrusion for Probiotic Yogurt Production

Konstantinos Alexias<sup>1\*</sup>, Georgia Frakolaki<sup>2</sup>, Tryfon Kekes<sup>2</sup>, Maria Katsouli<sup>2</sup>, Virginia Giannou<sup>2</sup> and Konstantina Tzia<sup>2</sup>

<sup>1</sup>Technical University of Delft, Netherlands

<sup>2</sup>National Technical University of Athens, Greece

Probiotic bacteria provide significant health benefits and can be incorporated into foods in order to develop functional products with particular commercial interest. According to IDF, the minimum concentration of probiotic bacteria in the final product should be  $10^7$  cfu/g. However, the survival of probiotic bacteria and the maintenance of their functionality during food processing and preservation, and through their passage from the gastrointestinal tract must be ensured. Encapsulation technology ensures the viability and integrity of the cells. Various encapsulation methods have been reported in the literature.

In this study, the encapsulation of *Bifidobacterium animalis* subsp. *Lactis* was achieved through freeze-drying and extrusion using various encapsulating agents. The encapsulated by freeze-drying bacteria were incorporated in milk ( $10^{11}$  cfu/L), while the encapsulated by extrusion bacteria were used ( $7,5 \times 10^{10}$  cfu/L) along with the conventional starter culture. In both cases, the inoculated milk was fermented into yogurt at 45°C. The time required to reach pH=4.5 was recorded as fermentation time. After fermentation was completed the physicochemical (viscosity, texture) and microbiological characteristics of the samples were evaluated.

In the case of encapsulation by freeze-drying, cyclodextrin provided bacterial load values of  $9 \times 10^5$  cfu/g and exhibited superior physicochemical characteristics amongst the encapsulating agents studied. In the case of encapsulation by extrusion, the highest bacterial load values in the final yogurt product were achieved by the mixtures of alginate-inulin and alginate-maltodextrin ( $1.54 \times 10^6$  cfu/g and  $9.6 \times 10^5$  cfu/g respectively) as encapsulating agents. The alginate-inulin mixture also provided samples with satisfactory physicochemical characteristics as well.

### Biography:

Konstantinos Alexias studied at the National Technical University of Athens, at the School of Chemical Engineering, where he completed his Diploma thesis under the supervision of Professor Constantina Tzia entitled: "Encapsulation of probiotic bacteria and incorporation of the encapsulated products in yoghurt". After his graduation on February 2018 (Diploma Grade: 8.01/10), he was offered a position at the Technical University of Delft, Netherlands as a Professional Doctorate in Engineering where he continues to work on up to now.