

The Use of Food Industry Bio-Products for Sustainable Lactic Acid Bacteria Encapsulation

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Abstract : Lactic acid bacteria (LAB) are microbial supplements that increase the nutritional, therapeutic, and safety value of food and feed. Often LAB strains are incubated in an expensive commercially available de Man-Rogosa-Sharpe (MRS) medium; the cultures are centrifuged, and the cells are washing with sterile water. Potato juice and apple juice industry bio-products are industrial wastes which may constitute a source of digestible nutrients for microorganisms. Due to their low cost and good chemical composition, potato juice and apple juice production bio- products could have a potential application in LAB encapsulation. In this study, pure LAB (*P. acidilactici* and *P. pentosaceus*) were multiplied in a crushed potato juice and apple juice industry bio-products medium. Before using, bio-products were sterilized and filtered. No additives were added to mass, except apple juice industry bioproducts were diluted with sterile water (1/5; v/v). The tap of sterilised mass, and LAB cell suspension (5 mL), containing of 8.9 log₁₀ colony-forming units (cfu) per mL of the *P. acidilactici* and *P. pentosaceus* was used to multiply the LAB for 72 h. The final colony number in the potato juice and apple juice bio- products substrate was on average 9.60 log₁₀ cfu/g. In order to stabilize the LAB, several methods of dehydration have been tested: lyophilisation (MilrockKieffer Lane, Kingston, USA) and dehydration in spray drying system (SD-06, Keison, Great Britain). Into the spray drying system multiplied LAB in a crushed potato juice and apple juice bio-products medium was injected in peristaltic way (inlet temperature +60 °C, inlet air temperature +150° C, outgoing air temperature +80 °C, air flow 200 m³/h). After lyophilisation (-48 °C) and spray drying (+150 °C) the viable cell concentration in the fermented potato juice powder was 9.18 ± 0.09 log₁₀ cfu/g and 9.04 ± 0.07 log₁₀ cfu/g, respectively, and in apple mass powder 8.03 ± 0.04 log₁₀ cfu/g and 7.03 ± 0.03 log₁₀ cfu/g, respectively. Results indicated that during the storage (after 12 months) at room temperature (22 +/- 2 °C) LAB count in dehydrated products was 5.18 log₁₀ cfu/g and 7.00 log₁₀ cfu/g (in spray dried and lyophilized potato juice powder, respectively), and 3.05 log₁₀ cfu/g and 4.10 log₁₀ cfu/g (in spray dried and lyophilized apple juice industry bio-products powder, respectively). According to obtained results, potato juice could be used as alternative substrate for *P. acidilactici* and *P. pentosaceus* cultivation, and by drying received powders can be used in food/feed industry as the LAB starters. Therefore, apple juice industry by- products before spray drying and lyophilisation should be modified (i. e. by using different starches) in order to improve its encapsulation.

Keywords : bio-products, encapsulation, lactic acid bacteria, sustainability

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