Evaluation of screening methods for biosurfactants production by *Lactobacillus* strains

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ABSTRACT

Biosurfactants are a group of compounds used in numerous applications based on the emulsification properties and the ability to reduce surface tension in a mixture of two liquids like oil-water (Sharma**,** 2016). Biosurfactants are amphiphilic molecules including both hydrophilic (e.g. long-chain fatty acid, hydroxyl fatty acid) and hydrophobic moieties (e.g. a carbohydrate, an amino acid, peptides, phosphate, alcohol). They constitute molecules of significant attention compared to the chemically synthesized surfactants as they are microbially produced and biodegradable. Likewise, microbial surfactants have been previously implemented in cosmetics and pharmaceutical formulations and also in food applications (Vecino, 2017). Biosurfactants can be synthesized extra-cellularly or can be bound on the cell surface of bacterial and yeast strains. Nonetheless, large scale production of biosurfactants is impaired from the high production cost and purification cost. Hence, research is directed towards the valorisation of agro-industrial waste and by-product streams as low-cost feedstocks for the fermentative production of biosurfactants. Previous studies have implemented the utilisation of lignocellulosic substrates and cheese whey as fermentation substrates for biosurfactants synthesis from lactic acid bacteria.

Lactic acid bacteria (LAB), including *Lactobacillus* strains are normally found in the microflora of various fermented food products and also in the indigenous microbiota of humans and animals, particularly on the mucosa of the proximal small intestine. *Lactobacillus* are generally regarded as safe (GRAS), exhibiting an additional advantage over other microbial surfactants producers (e.g. *Pseudomonas* strains) and have been applied on the food processing industry. *Lactobacillus* strains secrete substances like lactic acid, bacteriocins, hydrogen peroxide and biosurfactants that present a protective role against the growth and proliferation of pathogens (Agboola, 2014).

The aim of this study was to screen fifty *Lactobacillus* strains selected from four different culture collections, belonging to the species *L. plantarum*, *L. rhamnosus*, *L. pentosus*, *L. casei*, *L. coryniformis*, *L. delbrueckii*, *L. acidophillus*, *L. lactis* and *L. sakei*. Selection of strains was performed based on previously reported studies and focused on isolates obtained from dairy and meat products. Several methods were evaluated to test the capacity of the strains to produce biosurfactants using two different commercial fermentation media. Haemolytic activity using the blood agar method, oil displacement test, emulsification activity (E_{24} and E_{48}) and surface tension measurements were employed as screening methods to select the most promising candidates. Lactose consumption was also evaluated in all strains under the context of conducting fermentations using the lactose from cheese-whey as a low-cost nutrient supplement. In line with this, future research will implement the optimisation of fermentation conditions for the bioconversion of cheese-whey and other food waste streams to produce biosurfactants from the selected best performing *Lactobacillus* strains.

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