Inhibition of pathogenic and spoilage bacteria by a novel biofilm-forming Lactobacillus isolate: a potential host for the expression of heterologous proteins

ABSTRACT

Background: Bacterial biofilms are a preferred mode of growth for many types of microorganisms in their natural environments. The ability of pathogens to integrate within a biofilm is pivotal to their survival. The possibility of biofilm formation in Lactobacillus communities is also important in various industrial and medical settings. Lactobacilli can eliminate the colonization of different pathogenic microorganisms. Alternatively, new opportunities are now arising with the rapidly expanding potential of lactic acid bacteria biofilms as bio-control agents against food-borne pathogens. Results: A new isolate Lactobacillus plantarum PA21 could form a strong biofilm in pure culture and in combination with several pathogenic and food-spoilage bacteria such as Salmonella enterica, Bacillus cereus, Pseudomonas fluorescens, and Aeromonas hydrophila. Exposure to Lb. plantarum PA21 significantly reduced the number of P. fluorescens, A. hydrophila and B. cereus cells in the biofilm over 2-, 4- and 6-day time periods. However, despite the reduction in S. enterica cells, this pathogen showed greater resistance in the presence of PA21 developed biofilm, either in the plank‑tonic or biofilm phase. Lb. plantarum PA21 was also found to be able to constitutively express GFP when transformed with the expression vector pMG36e which harbors the gfp gene as a reporter demonstrating that the newly isolated strain can be used as host for genetic engineering. Conclusion: In this study, we evaluate the ability of a new Lactobacillus isolate to form strong biofilm, which would provide the inhibitory effect against several spoilage and pathogenic bacteria. This new isolate has the potential to serve as a safe and effective cell factory for recombinant proteins.

Keyword: Biofilm; Lactobacillus plantarum; Food-borne pathogens; Microbial cell factory; Gfp