Survival of a probiotic culture incorporated into orange juice after spray-drying

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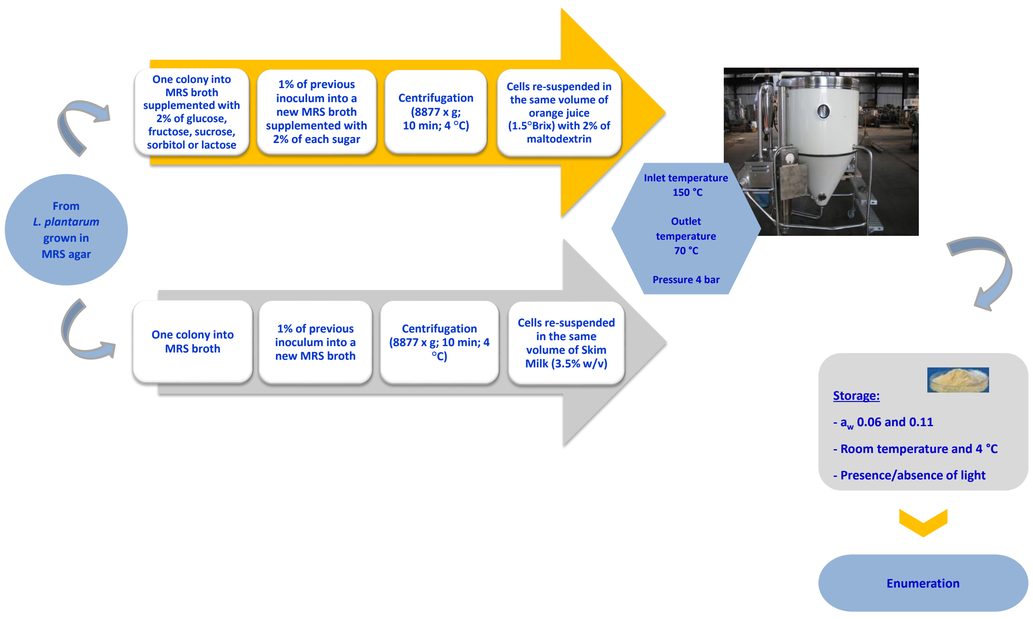
Introduction

Probiotic bacteria such as lactic acid bacteria (LAB) have been linked to several health benefits to humans, especially in the prevention of intestinal disorders. The production of a beverage, such as orange juice, would be more valuable with a probiotic culture incorporated. However, is inevitable to dry this mixture, since products with bacterial cultures into powder form are more stable than into liquid form.

Spray-drying is a well-known technique to transform liquid products into powder form and several authors have been describing the drying of orange juice by this method (Chegini and Ghobadian, 2007; Goula and Adamopoulos, 2010) as well as the drying of probiotic cultures (Ananta et al., 2005; Reddy et al., 2009). The survival of this spray-dried cultures during storage is greatly influenced by storage conditions such as storage temperature or exposure to light and many studies mentioned the inclusion of some sugars during growth or even during drying to improve and/or maintain the viability of the cells (Carvalho et al., 2002; Silva et al., 2004).

The objective of this work was to produce spray-dried orange juice containing a probiotic culture (*Lactobacillus plantarum* deposited in ESB Culture Collection) grown in the presence of different sugars and assessing its survival during drying and subsequent storage.



Results

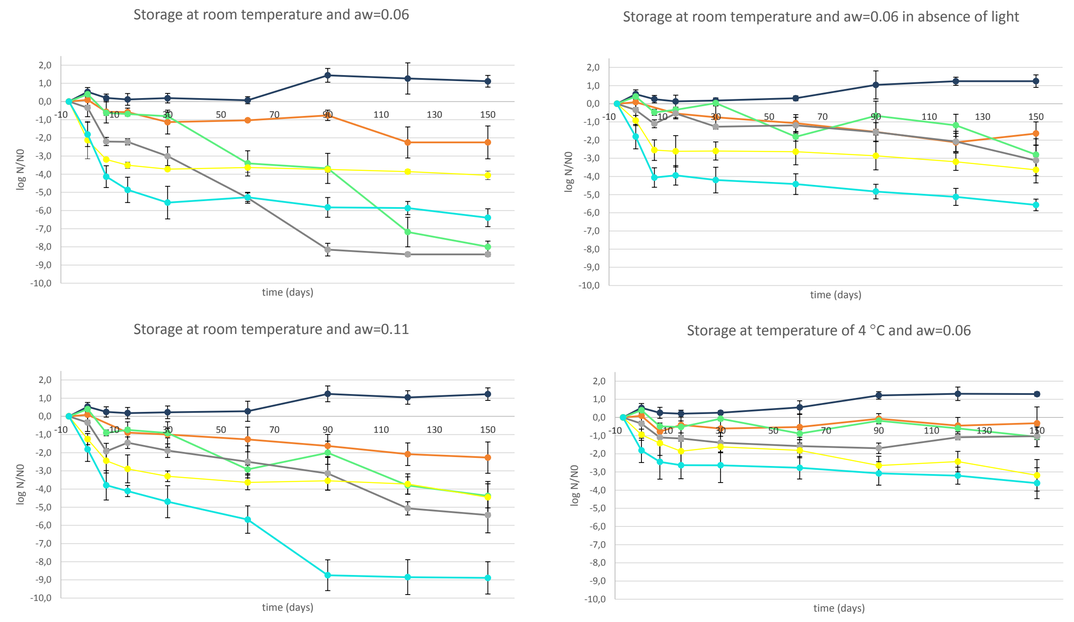


Figure 1. Log reductions of *L. plantarum* grown: i) in culture media and incorporated in Skim Milk as control ( ), ii) in culture media with glucose ( ), fructose ( ), sorbitol ( ), sucrose ( ) and lactose ( ) and incorporated in orange juice with 2% of maltodextrin and stored at different conditions of temperature and a_w.

Discussion

- The role of skim milk as protectant during drying processes and storage has been well described for different species (Ananta et al., 2005; Gardiner et al., 2000; Wong et al., 2010). As expected, there was no reduction in the survival of the probiotic dried in skim milk during storage at all the storage conditions.
- Different sugars were incorporated into the culture medium in order to verify their effect in the viability of *L. plantarum*, both during drying and during storage. The best condition seemed to be the growth in MRS supplemented with 2% of glucose.
- It is known that the storage conditions such as refrigeration temperatures, exposure to light and a_w are important factors in the preservation of viable populations of dried bacteria.

i) The decrease in viable cells was higher at room temperature than at 4 ºC.
ii) At 4 ºC cell death was minimal for *L. plantarum* grown in the medium supplemented with glucose, fructose and sorbitol.
iii) At room temperature, the highest viability was observed at a_w = 0.06 and in the absence of light.

As a conclusion of this study, we can produce an orange juice powder with a viable probiotics, however, the growth media and the storage conditions are extremely important to guarantee their viability.

References

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Acknowledgements

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