PROBIOTICATION OF FRUIT JUICES (ORANGE, SOUR CHERRY, PLUM AND BLACK CHOKEBERRY JUICE) BY LACTIC ACID FERMENTATION

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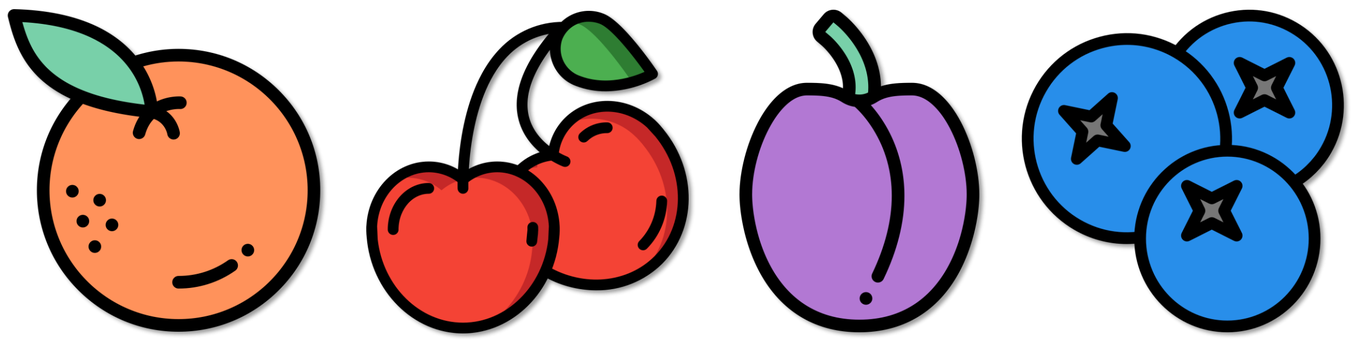
01 INTRODUCTION

Fruit juices are healthy, having a high content of antioxidants, vitamins, minerals, dietary fiber and many other beneficial nutrients and hence could serve as a good medium for lactofermentation. Fermentation significantly reduces the sugar content extending the shelf-life of fruit-based beverages and improves their nutritional value. Consequently, it is worthwhile to investigate the development of a fermented product that combines the beneficial effects of lactofermented juices and probiotics. The aim of our study was to investigate the possibility of the probiotication of fruit juices (orange, sour cherry, plum and black chokeberry juice) by fermentation with probiotic starter culture. We investigated the fermentation properties of different *Lactobacillus* strains to find the most suitable probiotic strain(s) to produce high added value fermented juices.



02 MATERIALS & METHODS

For fermentation three varieties of orange juice, two varieties of sour cherry, two varieties of plum and two varieties of black chokeberry were used. During strain selection 9 – among them 6 probiotic – *Lactobacillus* strains (*Lactobacillus* (*L.*) *rhamnosus* GG, *L. casei* Shirota, *L. reuteri* DSM 17938, *L. acidophilus* LA-5, *L. casei* LC-01, *L. acidophilus* 150, *L. acidophilus* N2, *L. plantarum* 2142 and *L. fermentum* DT41) were investigated. The properties of the strain, such as reproduction and metabolism, and its effect on the raw material – pH and total soluble solids – were studied, and the lactic acid fermented juices' bioactive components were also measured. The Response Surface Methodology (RSM) based on Central Composite Design (CCD) was used to evaluate and optimize the combined effect of fermentation's parameters.

03 RESULTS

In preliminary experiments the juices were inoculated with *Lactobacillus* strain in natural form and incubated at 30 °C for 24 hours. It was observed that juices in their natural form do not provide an adequate environment for the growth of *Lactobacillus.* Determination of optimal conditions of fermentation was done by considering the growth and final viable cell counts. Fermentation were carried out with supplementation, dilution and adjustment of pH (*Table 1*) because of their positive significance on proliferation. That even resulted in about two orders of magnitude increase compared to the native form of the juices. A significant difference was observed between the number of viable cells of certain *Lactobacillus* strains (*Figure 1*), so it is important to select the starter culture for the given raw material. The preservative-free fermented juices preserve their natural components, moreover the quantity of bioactive components could increase.

FRUIT JUICE	pH	DILUTION (juice : water, V/V)	SUPPLEMENTATION (g L^{-1})
Orange	7,00	-	Dextrose: 60, Yeast extract: 2
Sour cherry	5,80	6 : 4	Yeast extract: 3
Plum	6,50	5,5 : 4,5	Yeast extract: 6
Chokeberry	4,50	8 : 2	Peptone: 5,62

Table 1. Optimized parameter settings for fruit juice lactic acid fermentation

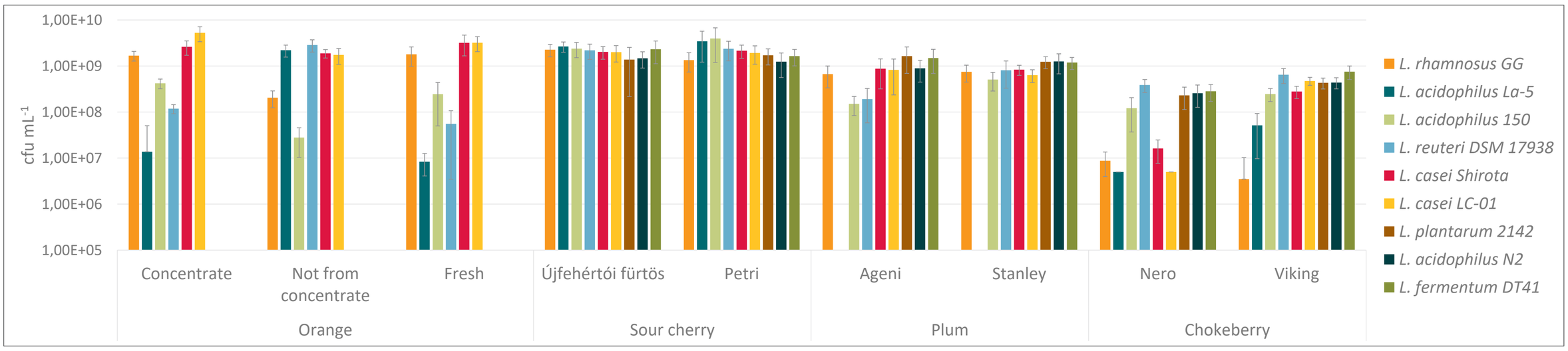


Figure 1. Viable cell number of *Lactobacillus* strains in cfu mL^{-1} in fruit juices with adjusted fermentation parameters

04 CONCLUSION

The results suggest that fermented fruit juices are a promising source for use as functional, non-dairy probiotic food. Under certain conditions it was possible to provide the adequate environment for the growth of *Lactobacillus* in fruit juices.