EVALUATION OF TWO *LACTOBACILLUS* STRAINS AS PROTECTIVE CULTURES FOR BIOPRESERVATION OF LOW-SALT SAUSAGE: EFFECT ON BACTERIAL COMMUNITIES

Mei Xu, Pan Huang, Conggui Chen, Peijun Li*
School of Food Science and Engineering, Hefei University of Technology, Anhui province, People's Republic of China
*Corresponding author email: lipeijun@hfut.edu.cn

I. INTRODUCTION

In processed meat products, sodium chloride usually plays an important role in their quality and safety. However, excessive sodium intake can lead to hypertension and cardiovascular diseases [1]. Partial substitution of NaCl by KCl appears to be a good way to reduce sodium content in meat products. During the past decades, there were many studies focused on the textural and gelling properties of low-salt meat products while few focused on the storage stability. Some lactic acid bacteria (LAB) have been added to meat products as protective cultures to play a bio-protective role against pathogenic and/or spoilage microorganisms without changing sensorial attributes of meat foods [2]. However, there was no report on biopreservation of low-salt meat products by protective cultures. The aim of this study was to evaluate the effect of *Lactobacillus plantarum* R2 and *Lactobacillus sakei* B2 as protective cultures on bacterial communities in low-salt sausage stored at 5°C.

II. MATERIALS AND METHODS

Two *Lactobacillus* strains were tested in this study. *L. plantarum* R2 was isolated from dry sausage, a traditional type of naturally fermented Chinese style meat product. *L. sakei* B2, a commercial protective culture, was obtained from Chr. Hansen (Hørsholm, Denmark).

Low-salt chicken sausages were prepared with 1.75% NaCl and 0.75% KCl. After cooking at 80°C, the chicken sausages were cut into slices, and inoculated with *L. plantarum* or *L. sakei* at a concentration of 10^7 CFU/g meat. The control sample was prepared without inoculation. All samples were vacuum-packed and stored in refrigeration (5 ± 1°C).

All samples were subjected to microbial analysis at 0, 4, 8, 12, 24 and 32 d of storage. Culture-dependent and culture-independent methods were used to reveal the bacterial communities.

Comparison of multiple samples was conducted by ANOVA using Statistix 8.1 software (USA). Values of $P < 0.05$ were considered to be statistically significant.

III. RESULTS AND DISCUSSION

Bacterial counts

Compared to the control sample, *L. plantarum* and *L. sakei* were both found to suppress the growth of *Brochothrix thermosphacta* ($P < 0.05$; Fig. 1), which were reported to be the main spoilage bacteria in cooked meat products. And the count of *B. thermosphacta* in the sausage inoculated with *L. plantarum* was lower than that in the *L. sakei*-treated sample.

Bacterial communities by culture-independent method

As shown in Fig. 2, microflora of the inoculated sausages was dominated by the family *Lactobacillaceae*, whereas it was dominated by the family *Pasteurellaceae*, *Streptococcaceae* and *Fusobacteriaceae* in the control sample. *Pasteurellaceae* and *Streptococcaceae* are the major members of the microbiota in animals, especially in the gastrointestinal tract. These microorganisms can act as pathogens. *Fusobacteriaceae* and *Enterobacteriaceae* were reported to be associated with protein and lipid oxidation in meat products. The results showed that *L. plantarum* and *L. sakei* effectively inhibited the growth of unwanted microorganisms.

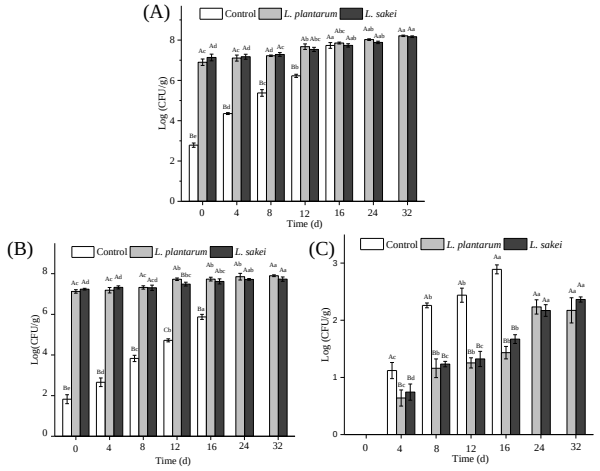

Fig.1. Changes of total plate count (A), counts of Lactic acid bacterial (B) and *B. thermosphacta* (C)

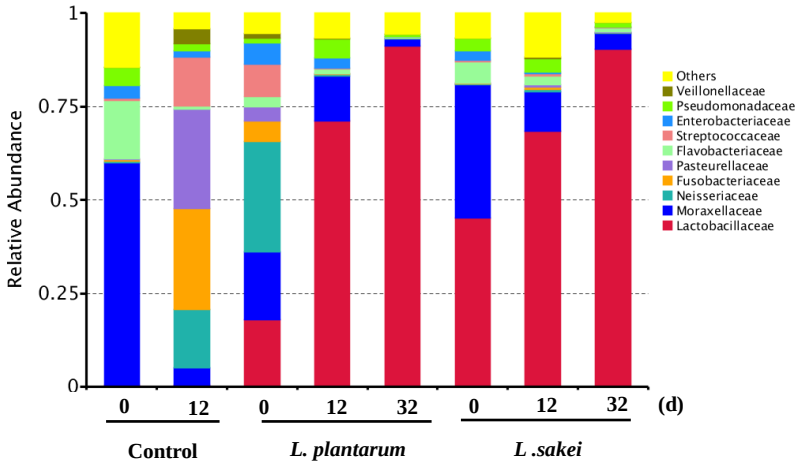

Fig.2.Changes in relative abundance at the family level of bacteria originated from low-salt sausage

IV. CONCLUSION

L. plantarum R2 and *L. sakei* B2 were found to show protective effect against *P. fluorescens* and *B. thermosphacta* in low-salt sausages. Also, they can inhibit the growth of *Fusobacteriaceae and Enterobacteriaceae*, which may contribute to the protein and lipid oxidation. This provides a potential way for biopreservation of low-salt sausage.

ACKNOWLEDGEMENTS

This work was financially supported by the Anhui Provincial Natural Science Foundation (No. 1608085QC70) and the National Natural Science Foundation of China (No. 31601498).

REFERENCES

1. Doyle, M. E. & Glass, K. A. (2010). Sodium reduction and its effect on food safety, food quality, and human health. Comprehensive Reviews in Food Science & Food Safety 9(1): 44-56.
2. Castellano, P., Ibarreche, M. P., Massani, M. B., Fontana, C. & Vignolo, G. M. (2017). Strategies for pathogen biocontrol using lactic acid bacteria and their metabolites: a focus on meat ecosystems and industrial environments. Microorganisms 5(3): 38.