

Introduction

Salt has been used as a food additive and preservative in meat products for many centuries [1]. As excessive sodium intake can lead to cardiovascular and cerebrovascular diseases, primary liver cancer, and atrial fibrillation [2], low-salt reformulations of traditional meat products have been developed. Nevertheless, while salt reduction may address the issue of excessive sodium intake, the effects of using reduced amounts of salt must be carefully considered and raise questions regarding the microbiological stability and shelf-life of the products.

Purpose

This study aimed to assess the impact of reducing the salt content in the formulation of sliced *chouriço* on the growth of Total Viable Counts (TVC) and Lactic Acid Bacteria (LAB) during the shelf-life of the product.

Methodology

1. Sampling



Chouriço Standard

$aw^* = 0.9688 \pm 0.012$



Reduced-salt Chouriço

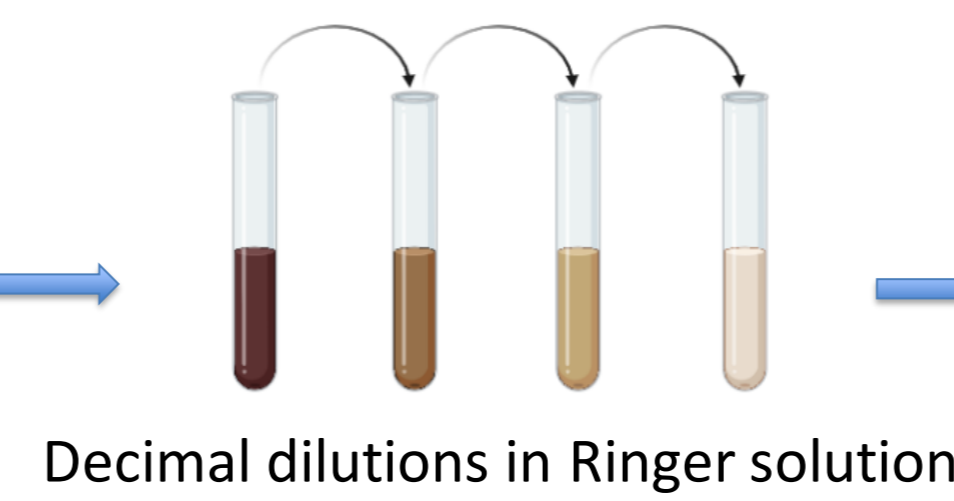
$aw^* = 0.9678 \pm 0.015$

* Measurements in Aqualab TDL 2

2. Microbiological analysis

During 60 days of storage at 4 °C and 10 °C (abuse temperature)

25 g of sample
+ 225 mL BPW



Decimal dilutions in Ringer solution



Incorporation technique

- Total viable counts at 30 °C (PCA, 30 °C, 72 h)
- Lactic Acid Bacteria (MRS, 30 °C, 72 h)

Results

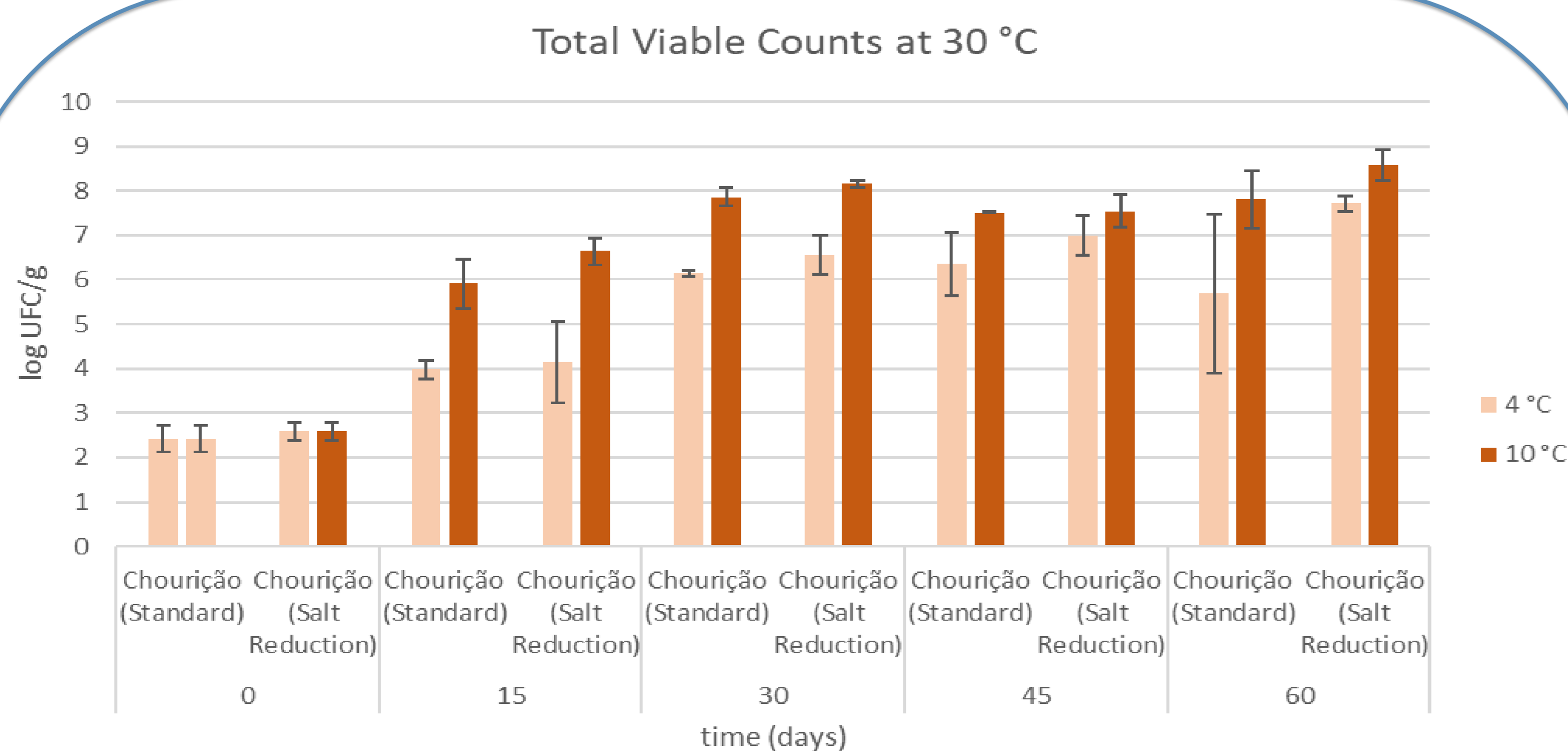


Figure 1. Total viable counts (log cfu/g) of *chouriço* samples during 60 days of storage at 4 and 10 °C.

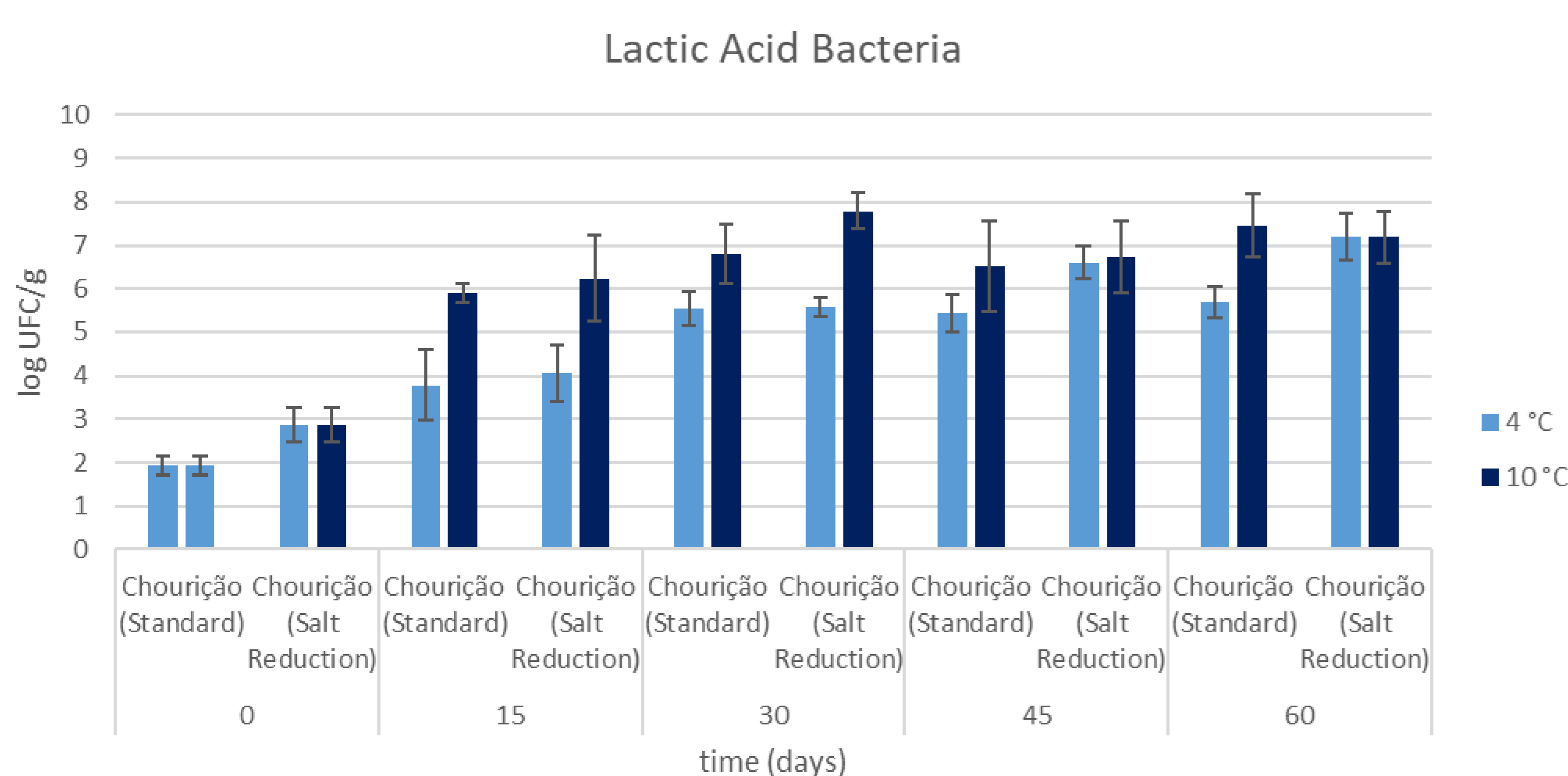


Figure 2. Lactic acid bacteria counts (log cfu/g) of *chouriço* samples during 60 days of storage at 4 and 10 °C.

Discussion

- An increase in the number of TVC (Figure 1) and LAB (Figure 2) was observed over the 60 days of storage at the two temperatures tested, although this increase was more pronounced at 10 °C (abuse temperature).
- Regarding TVC (Figure 1), an increase in the bacterial levels was observed in the salt-reduced prototypes compared to the standard samples, particularly in samples stored at 10 °C (4 and 6-log cycle increase for the traditional formulation (*chouriço standard*), and 6 and 7-log cycle increase for salt-reduced prototypes, at 4 °C and 10 °C, respectively).
- Regarding LAB (Figure 2), an increase of 4 and 5-log cycles was observed at 4 °C and 10 °C, respectively, for the traditional *chouriço*, while an increase of 5-log cycles was observed at both temperatures for the salt-reduced salt formulation.

Conclusions

Salt plays a critical role in the preservation of meat products. Therefore, product reformulation that involves salt reduction must ensure the same degree of economic and technological feasibility, and, most importantly, maintain the microbiological quality of the final product.

New reduced-salt formulations must be further studied, such as physico-chemical characteristics, sensory analysis and challenge tests with target foodborne pathogens, and new hurdles should be introduced or improved in *chouriço* production to achieve the same microbiological stability and shelf-life.

References and Acknowledgements

1. Singh, R. Paul and Davidson, P. Michael. "food additive". Encyclopedia Britannica, 26 Jul. 2023, <https://www.britannica.com/topic/food-additive>. Accessed 22 April 2024.
2. Ji Wang, Xu-Hui Huang, Yu-Ying Zhang, Shengjie Li, Xiuping Dong, Lei Qi. Effect of sodium salt on meat products and reduction sodium strategies — A review, Meat Science, 205,2023, <https://doi.org/10.1016/j.meatsci.2023.109296>.

Acknowledgements

This work was supported by agenda VIIAFOOD – *Plataforma de Valorização, Industrialização e Inovação Comercial para o setor Agroalimentar* (C644929456-00000040), funded by PRR – *Plano de Recuperação e Resiliência e pelos Fundos Europeus NextGeneration EU* Financial. Support for author T. Bento de Carvalho was provided by a doctoral fellowship 2023.03709.BD (FCT).