



Apple Puree Pasteurization by Pulsed Electric Fields: From Microbial Safety to Financial Viability Assessment

Enrique Pino-Hernández^{1*} [0000-0001-5689-198X], Paula Valério^{2*}, Sara Dias¹, Marta B. Evangelista¹, and Marco Alves¹

¹ INOV.LINEA - Agri-food Technology Transfer and Valorization Center, TAGUSVALLEY – Science and Technology Park, 2200-062, Abrantes, Portugal

² INOV.POINT - Business Hosting and Entrepreneurship, TAGUSVALLEY – Science and Technology Park, 2200-062, Abrantes, Portugal
marco_alves@tagusvalley.pt

Abstract. Food industries have been developing more sustainable preservation processes that maintain the nutritional value of foods and meet consumers' demands by providing safe and healthy products with a long shelf-life. Thus, it was necessary to study and take on challenges throughout the production process. The goal of this work was to evaluate the effect of pulsed electric fields (PEF) on the apple puree quality and to present a model that supports investment decisions taken by Portuguese agri-food companies on using PEF equipment to pasteurize the fruit product. PEF treatment ($E= 10$ kV/cm and $q= 644$ kJ/kg) was applied to apple puree at a laboratory scale. The processing conditions established resulted in 5-log CFU/g reduction of *Escherichia coli*. Puree PEF-treated and stored at 4°C for 30 days was compared to puree without treatment regarding aerobic bacteria and yeast and mold. Moreover, financial viability assessment was developed using *Banco de Portugal* data (year 2021) for the classification of economic activities, namely 10320. The results of the technical and financial analysis indicate PEF pasteurization is suitable for upgrading pasteurization process. The investment required on PEF equipment for upgrading pasteurization process under study showed an internal rate of return of 21.54% and a payback of 4 years. In what concerns the final product, PEF treatment ensures the microbial stability of puree for at least 30 days. In conclusion, this study established the PEF conditions for puree non-thermal pasteurization and also showed a suitable model to support a decision investment on PEF technology.

Keywords: Decision Investment, Non-thermal Pasteurization, Reineta Apple.

Acknowledgements. We would like to thank Cooperfrutas CRL for providing the raw material for the experiments performed for this work.

Funding. This work was financially supported by the projects TAGUSVALLEY2030 RHaq (CENTRO-04-3559-FSE-000143), TAGUSVALLEY2030 IT (CENTRO-04-3559-FSE-000143), and WINBIO (POCI-01-0246-FEDER-181335) under European Social Fund from the European Union managed by CENTRO 2020 and PORTUGAL 2020.

*These authors contributed equally to this study and share first authorship.