Bioactive alternatives to mitigate foodborne pathogens

Inês Azevedo Moreira[1], Joana Barbosa[1], Helena Albano[2,3], Paula Teixeira[1]

[1]Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, [2]Escola Superior de Enfermagem de Coimbra, [3]Instituto Politécnico de Viana do Castelo

CATÓLICA ESCOLA SUPERIOR DE BIOTECNOLOGIA PORTO

MICRO BIOTEC 21 Webconference

CONGRESS OF MICROBIOLOGY AND BIOTECHNOLOGY 2021

Introduction

Foodborne pathogens are a significant global food safety problem. In response to nutritional and health problems, consumers' perception, and negative opinions of artificial preservatives in food, the food industry is searching for "clean" alternatives that consumers recognize as natural. Bioactive substances deriving from plants, animals, or microorganisms, might present the possibility of preventing and controlling foodborne diseases. Consequently, alternatives such as plant extracts are now being accepted by the food industry as good options to prevent bacterial growth that lead to food spoilage and foodborne diseases (**1**,**2**).

Objective

In vitro determination of minimum inhibitory concentrations (MIC) of 3 commercially available plant extracts against different strains of *Escherichia coli*, *Listeria monocytogenes*, *Salmonella* Enteritidis and *Staphylococcus aureus*.

Methodology

In vitro broth dilution method was used to determine minimum inhibitory concentrations. For that, three commercially available plant extracts - Oleuropein (a derived term from the botanical name of the olive tree, *Olea europaea*), Rosemary (derived from *Rosmarinus officinalis* L.), and Shiitake mushroom (derived from *Lentinus edodes*) were successively diluted and then inoculated with different target bacteria overnight (37ºC/24h).

Figure 1 - Selected plant extracts

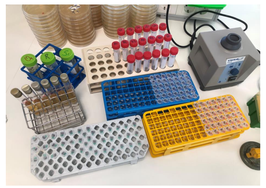

Figure 2 – Series of dilutions and target bacteria inoculation

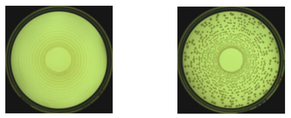

Figure 3 – Obtained results examples

Results

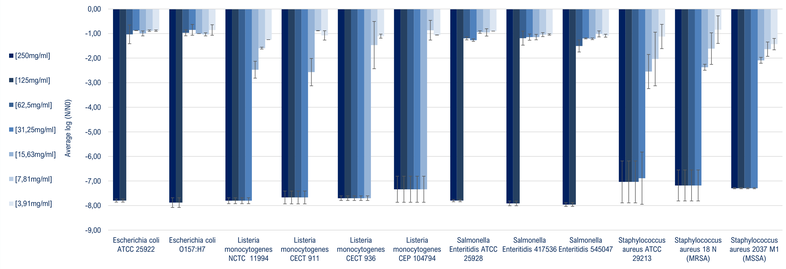

Figure 4 – Average log (N/N0) of minimum inhibitory concentrations of Oleuropein [mg/ml]

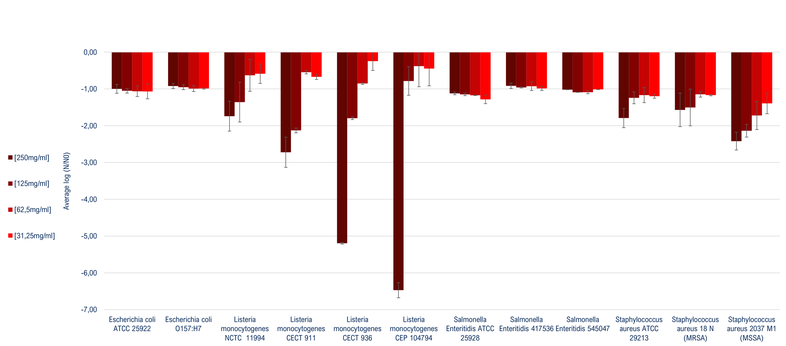

Figure 5 – Average log (N/N0) of minimum inhibitory concentrations of Rosemary [mg/ml]

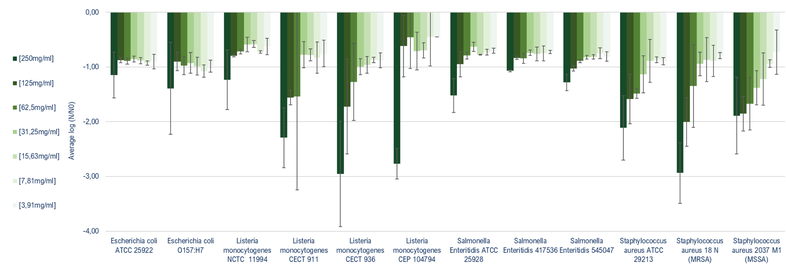

Figure 6 – Average log (N/N0) of minimum inhibitory concentrations of Shiitake mushroom [mg/ml]

Discussion & Main Conclusions

Oleuropein extract inhibited the growth of all *L. monocytogenes* and *St. aureus* strains with MIC values of 31.25/62.50mg/ml and 31.25mg/ml, respectively. Although to a lesser extent, all *E. coli* and *Salm.* Enteritidis tested strains were inhibited at MIC values of 125.00mg/ml.

Rosemary extract was effective against *L. monocytogenes* strains, with MICs values between 125.00 and 62.50mg/ml, but no effect on *E. coli*, *Salm.* Enteritidis and *S. aureus* strains was observed.

Concerning Shiitake mushroom extract, all *L. monocytogenes* and *St.* aureus strains growth was inhibited with MIC values between 250 and 125mg/ml. Related to *E.* coli and Salm. Enteritidis no antimicrobial activity was observed.

These results indicate that Oleuropein has the potential to be used as an antimicrobial to control foodborne pathogens. Further investigation is required, specially to investigate if this natural product can be used on different food matrices and packaging systems.

References

1. Sánchez-Gutiérrez, M.; Bascón-Villegas, I.; Rodríguez, A.; Pérez-Rodríguez, F.; Fernández-Prior, Á.; Rosal, A.; Carrasco, E. "Valorisation of Olea europaea L. Olive Leaves through the Evaluation of Their Extracts: Antioxidant and Antimicrobial Activity". Foods **2021**, 10, 966. https://doi.org/10.3390/foods10050966

2. Wang, Liyan, Hongyue Guo, Xuejun Liu, Guochuan Jiang, Cheng Li, Xiuyi Li, and Yu Li. 2019. "Roles of Lentinula Edodes as the Pork Lean Meat Replacer in Production of the Sausage." Meat Science **2018**, 156, 44–51. https://doi.org/10.1016/j.meatsci.2019.05.016

Acknowledgements

This work was developed in the scope of the project "cLabel+: Innovative "clean label" natural, nutritious and consumer-oriented foods" (POCI-01-0247-FEDER-046080), co-financed by the Fund European Regional Development (ERDF) through the Competitiveness and Internationalization Operational Program (POCI).

Financial support for authors I. Moreira and J. Barbosa was provided by the PhD grant SFRH/BD/125275/2016 and the post-doctoral fellowship SFRH/BPD/113303/2015, respectively.

cLABEL+ CLEAN LABEL FOOD

UNIÃO EUROPEIA

Fundo Europeu de Desenvolvimento Regional

GOVERNO DA REPÚBLICA PORTUGUESA

FCT Fundação para a Ciência e a Tecnologia