

FERMENTATION PROCESS DESIGN FOR THE VALORIZATION OF KIWI BIOMASS

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SPOKE 8, WP 8.1, TASK 8.1.2

SPOKE 8: Circular economy in agriculture through waste valorization and recycling

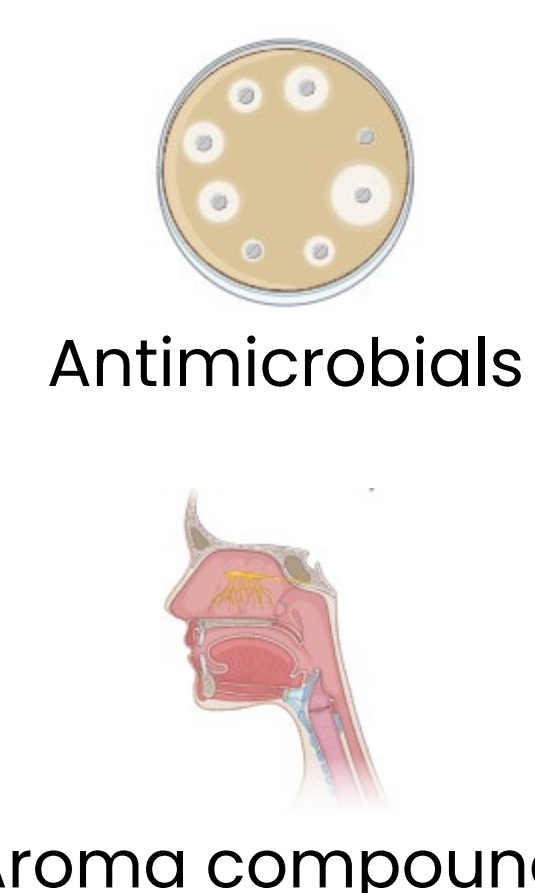
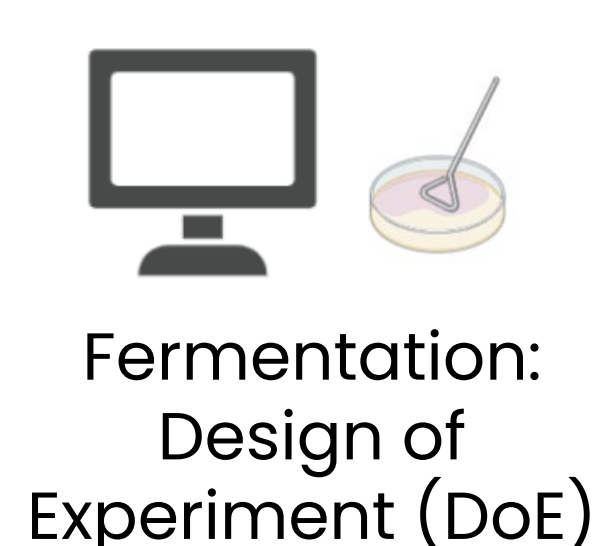
WP 8.1: Producing new products to upgrade waste value

Task 8.1.2: valorisation of the waste by biotechnology processes to obtain for high value molecules or new products

ABSTRACT AND AIM

Kiwifruits, belonging to the genus *Actinidia*, are largely consumed worldwide and their production generates a huge amount of by-products, all rich in value-added compounds that can be recovered for their properties and further industrial applications (1). This work focused on using bioprocesses and green extraction techniques to exploit kiwi pulp obtained from kiwifruit discarded for their size. The molecular characterization and the proximate composition of kiwi pulp have been studied to understand how to take advantage of Lactic Acid Bacteria (LAB) fermentation to recover aroma and antimicrobial compounds (2; 3; 4). A Design of the Experiment (DoE) has been built up to better understand this process and the experimental conditions were analyzed by HS-SPME/GC-MS technique to evaluate the volatile profile. In addition, all samples were extracted with an Accelerated Solvent Extractor (ASE) with ethanol-water, and the growth ability of *L. monocytogenes* in the extracts was assessed using a microplate reader. The fermentation process showed a high influence on the production of volatile compounds, with the fermentation conditions leading to different aroma compounds. Moreover, fermentation seems to affect the antimicrobial activity of the fermented biomasses against *L. monocytogenes*. These results open new prospects for exploiting kiwifruit wastes from harvesting and processing.

MATERIAL AND METHODS



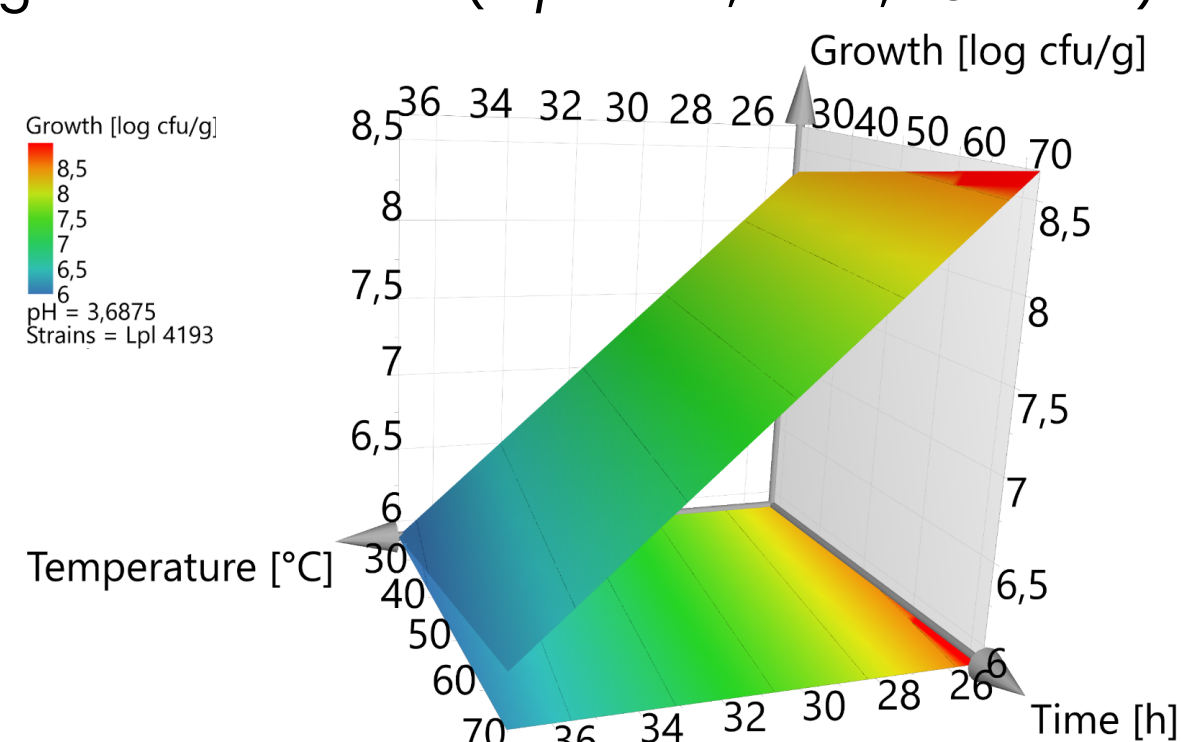
RESULTS

Fermentation: DoE

DoE: Factors	
Temperature	25 to 37°C
Time	28 to 72 h
pH	3,5 to 5
Strains	Lp 2243; Lf 4841; Lpl 4193; Ef 2261; Sp 1980; yeast KXI; Ll 2276; Lc 6180; Lm 6134

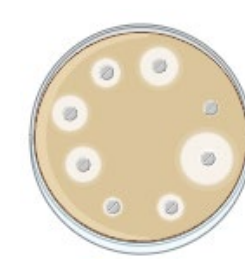


The response surface highlighted the best growth condition (*L. pl.* 4193, 25°C, 28 hours)



Antimicrobials

All samples were extracted with an Accelerated Solvent Extractor (ASE), with ethanol-water



The growth ability of *L. monocytogenes* in the extracts was assessed using a microplate reader

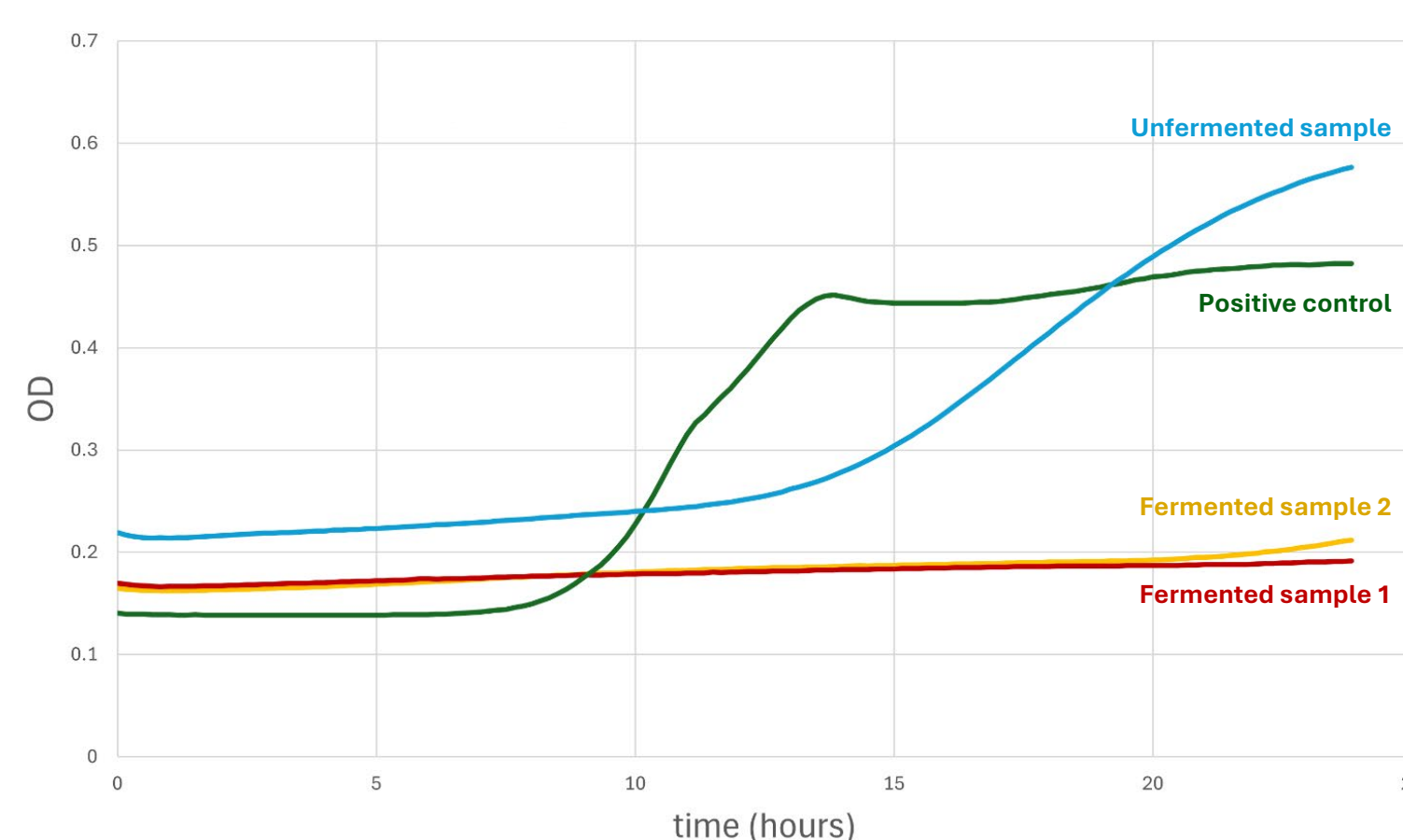


Figure 1: the graph reports the growth curves of *L. monocytogenes* in the two most effective extracts, compared to unfermented kiwi pulp extract and the positive control

Aroma compounds

All samples were analyzed by HS-SPME/GC-MS technique to evaluate the volatile profile

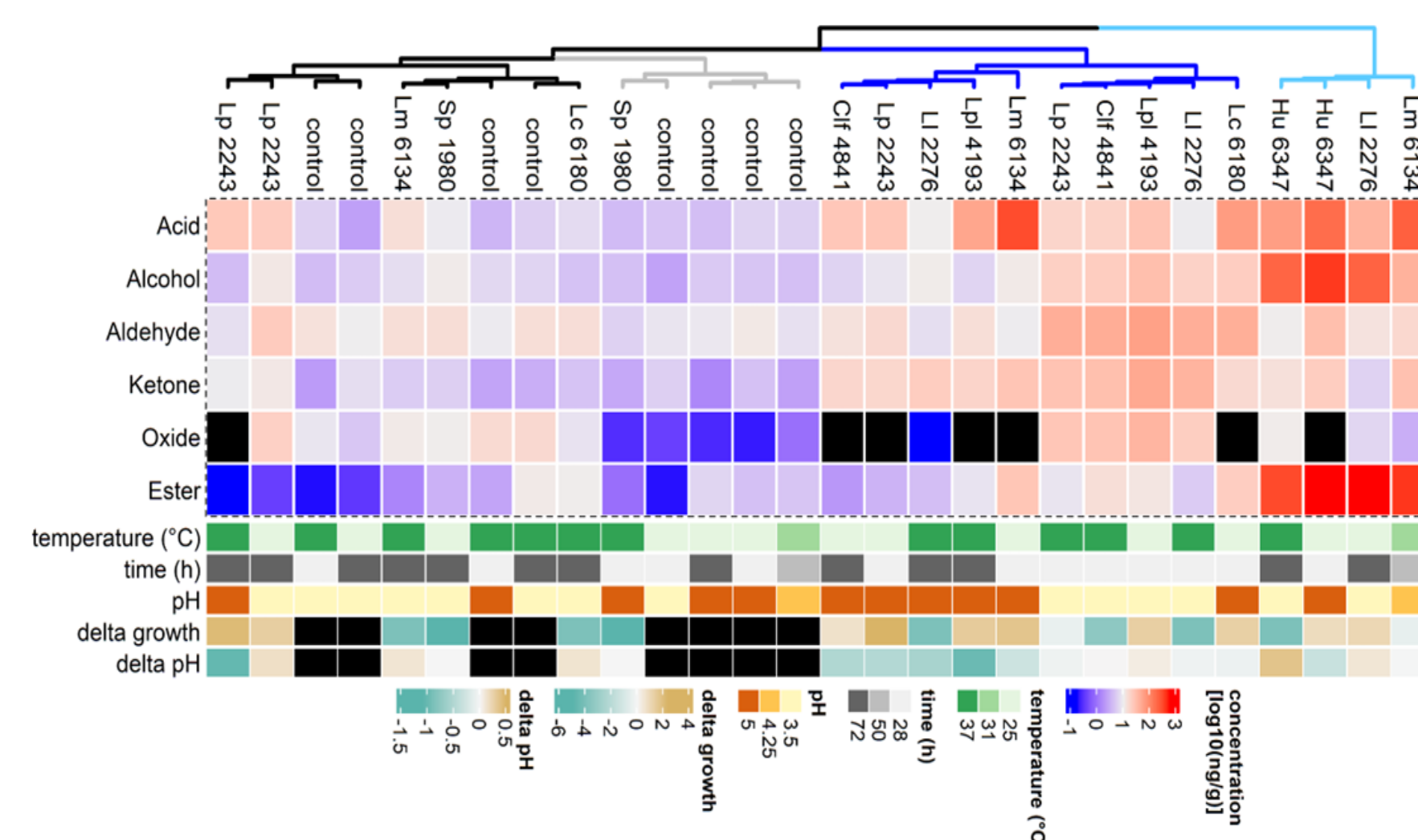


Figure 2: the heatmap shows the clustering of experimental conditions based on differences in the concentration of volatile organic compounds.

REFERENCE

- 1) F. Chamorro and others, 'Valorization of Kiwi Agricultural Waste and Industry By-Products by Recovering Bioactive Compounds and Applications as Food Additives: A Circular Economy Model', *Food Chemistry*, 370 (2022), p. 131315, doi:10.1016/j.foodchem.2021.131315.
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- 3) Annalisa Ricci and others, 'Vegetable By-Product Lacto-Fermentation as a New Source of Antimicrobial Compounds', *Microorganisms*, 7.12 (2019), p. 607, doi:10.3390/microorganisms7120607.
- 4) Jasmine Hadj Saadoun and others, 'Fermentation of Agri-Food Waste: A Promising Route for the Production of Aroma Compounds', *Foods*, 10.4 (2021), p. 707, doi:10.3390/foods10040707.