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Selection of Antifungal Lactic Acid Bacteria Combinations in Dairy Models and Antifungal Molecule Identification

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Context

Dairy products are susceptible to acid-tolerant fungal contaminants

Consequences: Food waste & Economic losses

Solution: Antifungal cultures are of growing interest as an alternative to chemical preservatives or a complement tool to hurdle technologies

Objective

To characterize the antifungal activity of lactic acid bacteria combinations as adjunct cultures in dairy models

Strategy & Results

Screening Strategy

- Screening in 24 well plates
- 2 models: mimicking Cheese & Yogurt
- Strains added as adjunct cultures along with the acidifying starter

13 combinations with the 5 selected lactic acid bacteria

L. harbinensis
L. plantarum
L. rhamnosus
L. brevis

3 binary combinations selected because of their higher antifungal activity than the strains alone

Antifungal score - 3: total inhibition - 2: partial inhibition - 1: no inhibition

Antifungal activity ≥ to that of commercial cultures

Antifungal molecules produced in higher amounts by the selected 5 antifungal combinations, in the presence of at least 1 of the 3 most resistant targets: Y. lipolytica and G. geotrichum

Metabolomics using 4 chromatographic methods

- HPLC-UV/RI for Organic Acids (OA)
- LC-MS for Organic Acids (OA)
- GC-FID for Fatty Acids (FFA)
- GC-MS for Volatile Compounds (VC)

Cheese

Yogurt

Antifungal molecules produced in significantly higher amounts by the 3 tested combinations in comparison to the controls

Conclusions

The screening strategy was successful to select antifungal combinations active in dairy matrices. The 3 selected combinations and their metabolites are natural antifungal alternatives of interest for the dairy industry.

Perspectives

The observed matrix-dependent effect shows the importance of in situ tests. Thus, challenge-tests are in process to determine the antifungal activity of the selected combinations in pilot-scale dairy products.