Integrative Microbiome Engineering and Nanobiotechnology Approaches for Precision-Controlled Fermentation of Table Olives

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Background

Olive fruit is produced from olive tree Olea europaea L., its bitter taste causes it unsuitable for consumption. Oldest biotechnological application such as fermentation in food processing is carried out to remove this bitterness. However, lack of control over processes cause spoilage microorganism and organoleptic problems during these old processes. This study aimed to incorporate nano encapsulated microbial modulator (which promote slow release of probiotics, also act as enzyme inhibitor) and nano biosensor for real time monitoring of metabolites production.

Methods

Fresh olives were be subjected to fermentation. Microbial communities were identified using 16S rRNA and ITS metagenomic sequencing. Chitosan-nisin nanoparticles were release gradually to target spoilage microorganisms. Monitering of fermentation were done by pH meter, plate count and GC-MS

Results

Metagenomic analysis indicates the presence of Lactiplantibacillus plantarum, Leuconostoc mesenteroides and Candida boidinii as well as Clostridium spp. and Pichia membranifaciens. Encapsulation efficiency of chitosan nanoparticles recorded was >80% and its sustained release in 72 hours under fermentation conditions. Nanoencapsulated nisin significantly reduce pH variability and improve acidification ($p < 0.05$). Biosensor detect cadaverine and putrescine during fermentation. Sensory evaluation indicates reduced bitterness and enhances texture and aroma

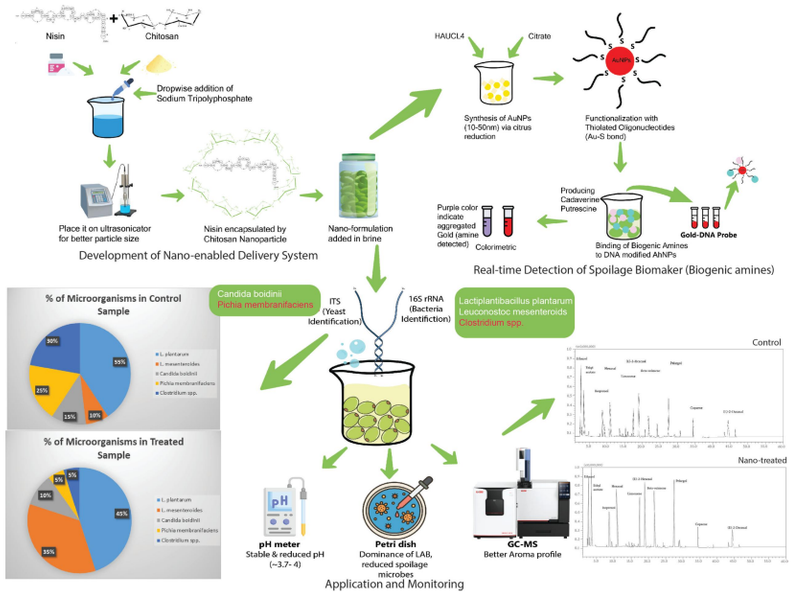

Fig 1. Graphical abstract of

Conclusions

This approach enhances product quality and safety by using selectively controlling microbial activity as well as real time monitoring of fermentation. Results highlighted that biosensor and nanocarriers can be used in traditional olive fermentation.

Reference

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