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Editorial: Biopreservation strategies for sustainable food processing

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Editorial on the Research Topic
Biopreservation strategies for sustainable food processing

Considering the current food trends marked by heightened consumer awareness of health and sustainability, the food industry faces an ever-growing demand for products that are not only safe but also produced with minimal impact on the environment (Hassoun et al., 2022). This call for a healthier and more conscientious approach for food production motivated the investigation of novel preservation strategies. As the guest editors of this Research Topic, titled "*Preservation strategies for sustainable food processing*," we proudly present a collection of research papers that explore biopreservation methods and their potential to improve food safety, quality, and sustainability.

In our call for papers, we highlighted the challenges encountered by food manufacturers. Ensuring food safety and quality while reducing the use of hazardous chemical additives has emerged as a pressing priority, driven by discerning consumers who seek clean label products. Simultaneously, the emergence of antibiotic-resistant foodborne pathogens and the recurring foodborne outbreaks have sparked an urgent quest for alternative preservation methods (Kim and Ahn, 2022). Conventional techniques, often comprising thermal and chemical processes, while effective in increasing microbiological food safety, may inadvertently compromise nutritional integrity and organoleptic characteristics of foods (Possas et al., 2018).

In response to these challenges, product specific biopreservation methods offer a promising path forward compared to conventional techniques, such as thermal treatments, which can cause a series of adverse effects, notably the degradation of heat-sensitive nutrients (e.g., vitamins and minerals), the depletion of volatile compounds, and the modification of texture through the breakdown of food's structural elements, including proteins (Aadil et al., 2019). Exploring the power of microorganisms, such as lactic acid bacteria, and their metabolites, such as nisin and bacteriocins, as protective cultures and preservatives aims to safeguard food products using natural and sustainable agents (Martinez et al., 2016). Additionally, the incorporation of natural preservatives, including bacteriocins, plant extracts and essential oils, into active packaging systems has shown enormous potential to extend food shelf-life and microbiological safety, by avoiding food spoilage and inhibiting the growth of pathogenic microorganisms (Azeredo et al., 2022).

The four papers featured in this Research Topic provide unique insights to the world of biopreservation. Sharma et al. present the "*Utilization of novel bacteriocin-synthesized silver nanoparticles (AgNPs) for their application in antimicrobial packaging for preservation of tomato fruit*." In this research, the antimicrobial potential of bacteriocins produced by *Lactobacillus* spp. against foodborne bacterial pathogens was investigated. Subsequently, the study evaluated the preservation effectiveness of silver nanoparticles synthesized using these bacteriocins and applied as coatings for tomato fruit. The findings demonstrated promising results, as the coatings effectively extended the shelf-life of the tomatoes.

Also, with regards to the use of coatings for biopresentation of fresh produce, the paper by Suriati et al. offers valuable insights into the "*Effect of additives on surface tension, viscosity, transparency, and morphology structure of aloe vera gel-based coating*." This research specifically focuses on how the addition of citric acid, ascorbic acid, and potassium sorbate, affects the coating's properties and stability. Understanding the impact of different additives and their concentrations on surface tension, viscosity, transparency, and morphology structure of coatings provide valuable information for developing more effective fruit preservation methods, contributing to reduce food waste.

In the context of fermented food products, Camprini et al. present the "*Effects of anaerobic and respiratory adaptation of Lacticaseibacillus casei N87 on fermented sausages production*." This study explores the impact of culturing this bacterium under anaerobic and aerobic conditions on its fermentation efficacy. The aerobic adaptation of the *L. casei* N87 culture resulted in sausages with comparable color parameters and aldehyde levels to those fermented conventionally with nitrate, indicating its potential as an alternative and effective method for sausage fermentation.

Finally, the work by Kakehi et al. titled "*Repeated and long-term cryopreservation of primary bovine myogenic cells to maintain quality in biomimetic cultured meat*" shows that cryopreservation at −80°C for both short-term and long-term storage does not compromise the abilities of myogenic cells harvested from bovine meat to proliferate or differentiate. With the growing interest in cultured meat as a sustainable and ethical alternative to conventional livestock meat production, efficient and high-quality cell preservation methods are essential to ensure a stable supply of cells for large-scale production.

The papers published in this Research Topic show that several factors may affect the biopreservation potential of the proposed strategies, including the growth conditions of bioprotective cultures, coating formulations and the antimicrobial potential of bacteriocins. Further research must dive into these methods to optimize strategies for extending both food quality and safety. In addition, the combination of biopreservation methods and clean label technologies, such as high-pressure processing, ultraviolet radiation, and sustainable active packaging systems presents opportunities for enhancing food safety while maintaining nutritional integrity and sensory attributes of foods. The evaluation of such synergistic approaches, as highlighted in our call for papers, could help to establish more environmentally friendly food processing methods.

The findings presented in this Research Topic evidence that biopreservation holds great promise for transforming the landscape of sustainable food processing. We thank all the authors for their valuable contributions to this Research Topic, as well as the reviewers and editorial team for their efforts in ensuring the scientific rigor and excellence of the papers published herein.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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