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Short Communication

Sorbic Acid Production by *Lactobacillus* spp.: A Sustainable Biotechnological Approach

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ABSTRACT

Sorbic acid is a widely used food preservative recognized for its strong antifungal and antimicrobial properties. Traditionally, sorbic acid is produced through chemical synthesis; however, increasing demand for natural and sustainable preservatives has stimulated research into microbial production systems. Certain strains of *Lactobacillus* have demonstrated the ability to produce sorbic acid or sorbate-like antimicrobial metabolites through fermentation of carbohydrate-rich substrates. This short communication highlights the potential of *Lactobacillus* spp. as biological producers of sorbic acid and discusses their significance in food preservation and industrial biotechnology.

***Keywords*:** Sorbic acid, *Lactobacillus*, Lactic acid bacteria, Natural preservatives, Fermentation, Biotechnological production, Antimicrobial metabolites.

Introduction

Sorbic acid (2,4-hexadienoic acid) is extensively utilized in the food, beverage, pharmaceutical, and cosmetic industries due to its effectiveness against molds, yeasts, and certain bacteria. The global trend toward clean-label and naturally derived ingredients has encouraged exploration of microbial biosynthesis pathways for sorbic acid production. Lactic acid bacteria, particularly *Lactobacillus* spp., are well known for producing organic acids and antimicrobial compounds during fermentation, making them attractive candidates for natural preservative production.

Microbial Production Mechanism

Certain *Lactobacillus* strains can convert carbohydrates and intermediary metabolites into unsaturated organic acids through specialized metabolic pathways. During fermentation, these bacteria produce various antimicrobial compounds including lactic acid, acetic acid, phenyllactic acid, and in some cases sorbic acid-like metabolites. The biosynthesis is influenced by factors such as substrate composition, pH, temperature, oxygen availability, and strain specificity.

Optimal production has been reported under controlled fermentation conditions with temperatures ranging from 30–37°C and pH values between 5.0 and 6.5. The use of renewable substrates such as molasses, fruit processing residues, and cereal hydrolysates can further enhance the sustainability of the process.

Applications

The biologically produced sorbic acid can serve as:

- A natural preservative in food and beverage products.
- An antifungal agent for bakery and dairy applications.
- A bio-based ingredient for cosmetic formulations.

- An alternative to synthetic preservatives in clean-label products.

Advantages of *Lactobacillus*-Based Production

- Renewable and environmentally friendly production process.
- Reduced dependence on petrochemical feedstocks.
- Consumer acceptance of naturally derived preservatives.
- Potential integration with existing fermentation industries.
- Lower environmental footprint compared with chemical synthesis.

Challenges and Future Perspectives

Despite promising laboratory-scale results, commercial production remains limited due to relatively low yields and incomplete understanding of the biosynthetic pathways involved. Advances in metabolic engineering, strain selection, systems biology, and fermentation optimization may significantly improve sorbic acid productivity. Future research should focus on pathway elucidation, scale-up studies, and regulatory assessment of naturally produced sorbic acid.

Conclusion

Lactobacillus spp. represent a promising platform for the sustainable production of sorbic acid and related antimicrobial compounds. Continued developments in microbial biotechnology may enable economically viable large-scale production, supporting the growing demand for natural preservatives in food and industrial applications.