



The Screening Of Lactic Acid Bacteria With Antioxidant Properties

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Abstract

Lactic acid bacteria (LAB) are known not only for their probiotic potential but also for their antioxidant properties. This study screened 378 LAB strains - both from collection and newly isolated from plant surfaces exposed to varying solar irradiance - to identify strains with significant antioxidant capacity. A modified hydrogen peroxide sensitivity test was developed to evaluate oxidative stress resistance efficiently. Strains exhibiting high resistance also showed enhanced production of phenolic and thiolic compounds, indicating their antioxidant activity. Findings revealed a correlation between solar irradiation levels and hydrogen peroxide resistance, suggesting environmental adaptation influences antioxidant potential. The study emphasizes the biotechnological relevance of selecting LAB strains with superior antioxidant properties for functional food development.

Introduction

Oxidative stress contributes to various degenerative diseases such as diabetes, cardiovascular disorders, and aging. Antioxidant intake is therefore vital for maintaining cellular health. However, synthetic antioxidants may not always be effective in vivo due to poor bioavailability. Lactic acid bacteria (LAB), traditionally used in food fermentation, have recently gained attention for their potential to produce natural antioxidant compounds. The present study aimed to explore the antioxidant capacity of different LAB strains, particularly those isolated from plants exposed to solar irradiation—a natural oxidative stress condition that might induce cellular antioxidant defences. Establishing a connection between environmental stress and bacterial antioxidant mechanisms could open new avenues in probiotic and functional food industries.

Objectives

1. To isolate and characterise LAB strains from diverse sources, especially plant surfaces from regions with different solar irradiation intensities.
2. To develop a simple and rapid screening method to identify LAB strains with high antioxidant potential.
3. To evaluate the antioxidant activity, thiol, and polyphenol production capacity of selected LAB strains in different media.
4. To determine the relationship between oxidative stress resistance and environmental conditions such as solar irradiation.

Methodology

1. Sample Collection: A total of 378 LAB strains were studied—168 from microbial collections and 210 newly isolated from plant surfaces, dairy, and fermented foods.

2. Isolation and Identification: Strains were isolated using MRS agar and identified through Gram staining and 16S rRNA PCR analysis.

3. Screening for Antioxidant Potential: A modified spot test using varying hydrogen peroxide concentrations (0.03–0.5%) assessed oxidative stress resistance.

4. Total Antioxidant Activity (TAA): Evaluated via ABTS+ radical cation assay and compared with Trolox standards.

5. Total Thiol and Phenolic Content: Determined spectrophotometrically using Ellman's reagent and Folin-Ciocalteu method respectively.

6. Statistical Analysis: Conducted in triplicate using Excel and StatSoft for correlation and mean value determination.

Results

- The majority of highly resistant LAB strains were isolated from plant surfaces exposed to higher solar radiation, fermented vegetables, and dairy products.
- Hydrogen peroxide resistance correlated positively with solar irradiation intensity.
- The new spot-test method proved efficient for large-scale antioxidant screening.
- Strains that survived high H₂O₂ concentrations displayed greater antioxidant activity.
- Phenolic compound production was medium-dependent—most strains produced phenolics in cucumber juice, while few did so in milk or MRS.
- Over half of the peroxide-resistant strains synthesised thiols across all tested media, unlike the sensitive ones.

Discussion

The study demonstrated that LAB from environments with higher oxidative stress, such as sun-exposed plant surfaces, naturally develop stronger antioxidant defence mechanisms. The link between solar irradiation and peroxide resistance supports the hypothesis that environmental adaptation enhances oxidative resilience. The production of phenolic and thiolic compounds by LAB indicates their role in detoxifying reactive oxygen species and contributing to the antioxidant capacity of fermented foods. These results also suggest that LAB could serve as biotechnological tools for developing antioxidant-enriched probiotic formulations. Moreover, the simple hydrogen peroxide spot-test method provides a practical approach for screening large microbial collections efficiently.

Conclusion

The research successfully identified LAB strains with high antioxidant potential and established a simple, effective screening method based on hydrogen peroxide resistance. Environmental factors such as solar radiation influence the oxidative stress tolerance of LAB. Strains capable of producing phenolic and thiolic compounds show strong promise for use in functional foods and probiotic formulations aimed at improving antioxidant intake. Further studies using GC and HPLC are required to characterize the specific antioxidant metabolites involved.

References

1. Livinska, O., Ivaschenko, O., Garmasheva, I., &Kovalenko, N. (2016). *The screening of lactic acid bacteria with antioxidant properties*. **AIMS Microbiology**, 2(4), 447–459. <https://doi.org/10.3934/microbiol.2016.4.447>

