

EXOPOLYSACCHARIDES PRODUCTION BY LACTIPLANTIBACILLUS PLANTARUM STRAINS ISOLATED FROM INDUSTRIAL RYE BREAD SOURDOUGHS

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INTRODUCTION

Exopolysaccharides (EPS) produced by lactic acid bacteria (LAB) are high-molecular-weight biopolymers that improve the texture, viscosity, and water retention of fermented foods and may also exhibit functional properties such as antioxidant and immunomodulatory activities. Traditional sourdough ecosystems serve as a reservoir of microbial diversity. They harbor unique EPS-producing strains that may be lost with the increasing use of standardized commercial starter cultures.

OBJECTIVE

This study evaluated the EPS production capacity of *Lactiplantibacillus plantarum* strains isolated from long-term propagated rye sourdoughs and compared them with a commercial starter strain to assess their potential as starter cultures.

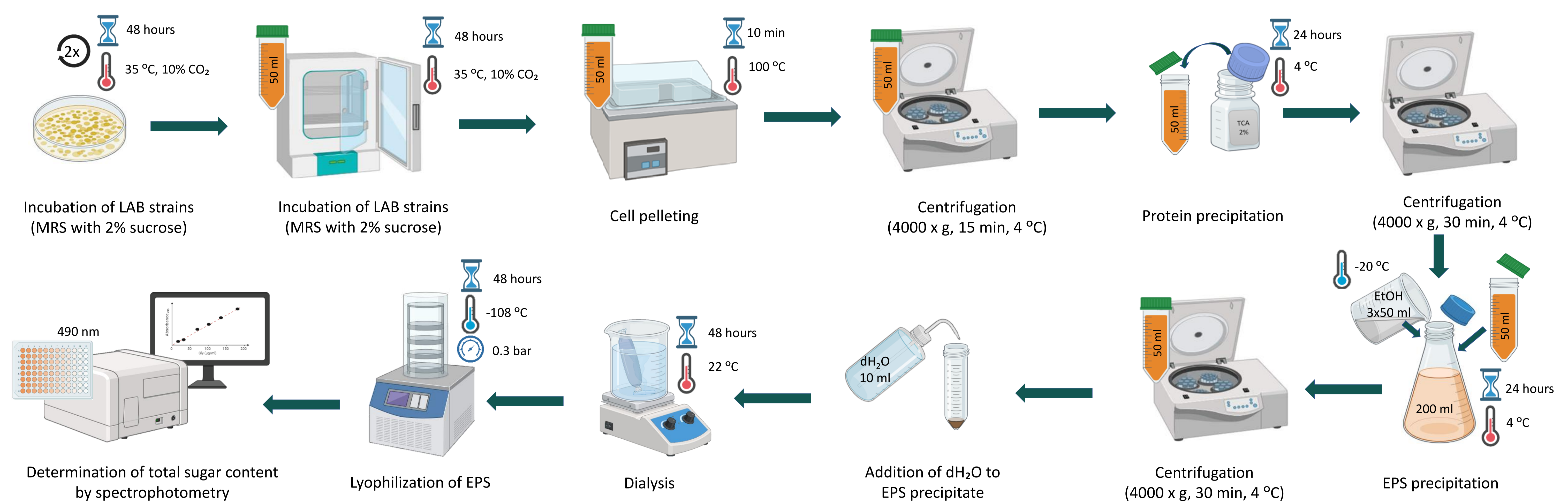


Fig. 1. An overview of the production, isolation, and analysis of EPS produced by *L. plantarum* strains.

RESULTS

- Glucose-equivalent carbohydrate content of *L. plantarum* EPS ranged from **278.3 to 362.8 $\mu\text{g}/\text{mg}$** (Fig. 2)
- Highest mean value: strain **A44** ($362.8 \pm 44.5 \mu\text{g}/\text{mg}$)
- Lowest mean value: strain **A57** ($278.3 \pm 37.1 \mu\text{g}/\text{mg}$)
- No significant differences in carbohydrate content between strains or genotypes ($p > 0.05$)
- Dry mass of lyophilized EPS did not differ significantly among strains ($p > 0.05$)

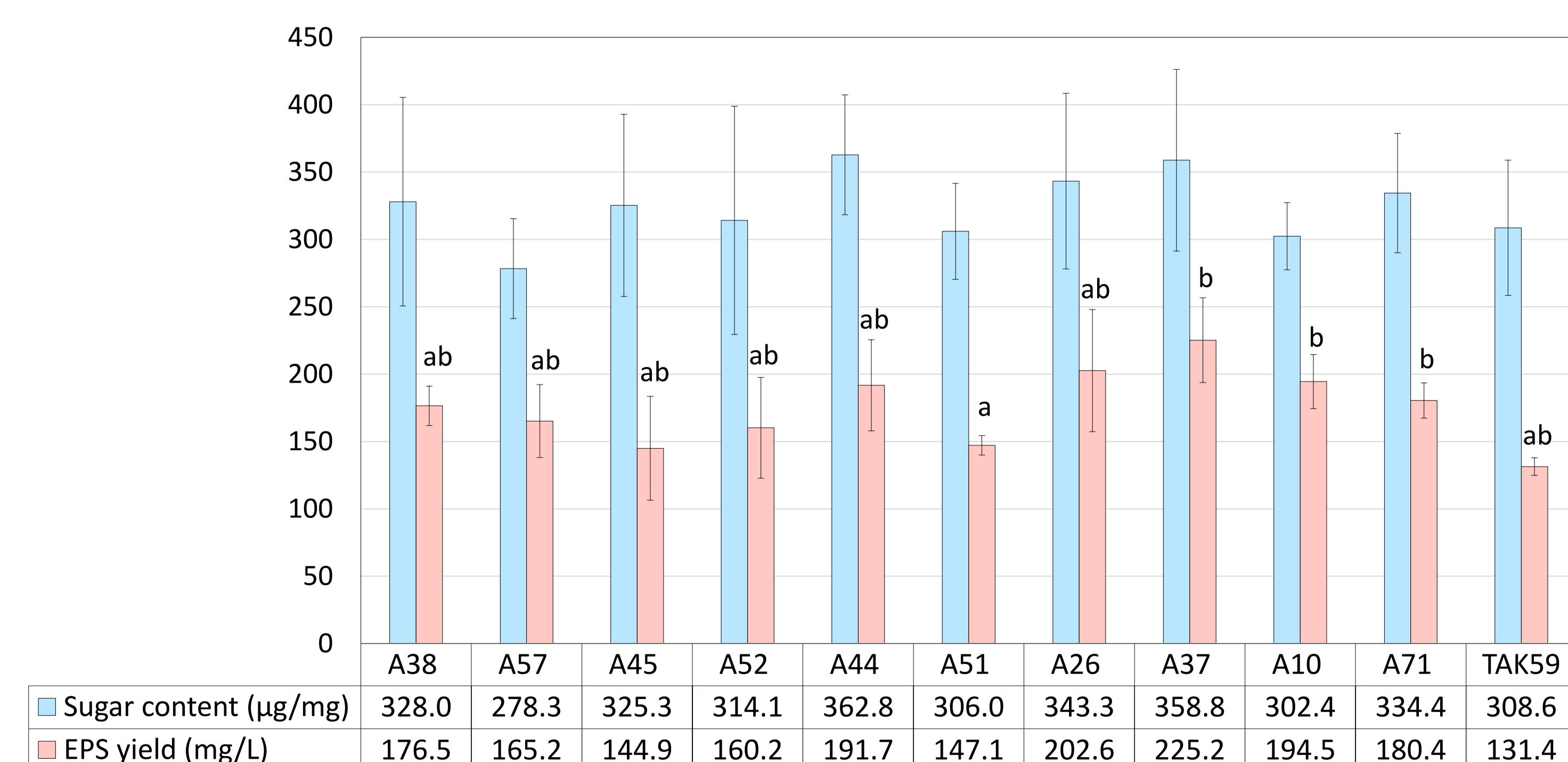


Fig. 2. Glucose-equivalent sugar content and EPS yield of *L. plantarum* strains. Error bars show standard deviations. Different lowercase letters indicate significant differences ($p < 0.05$).

METHODOLOGY

Ten *L. plantarum* strains isolated from an Estonian industrial sourdough and one commercial starter strain, *L. plantarum* TAK59 (Nordwise Biotech OÜ, Estonia), were analyzed (Table 1). EPS production was assessed after cultivation in MRS broth supplemented with 2% sucrose. EPS was then isolated and quantified using gravimetric and phenol-sulfuric acid methods (Fig. 1).

Table 1. Studied *Lactiplantibacillus plantarum* strains

Genotype	LAB strains	
G1	<i>L. plantarum</i> A38	<i>L. plantarum</i> A57
G5	<i>L. plantarum</i> A45	<i>L. plantarum</i> A52
G6	<i>L. plantarum</i> A44	<i>L. plantarum</i> A51
G9	<i>L. plantarum</i> A26	<i>L. plantarum</i> A37
G12	<i>L. plantarum</i> A10	<i>L. plantarum</i> A71
-	<i>L. plantarum</i> TAK59	

CONCLUSIONS

- ❖ All studied *L. plantarum* strains produced EPS under the tested conditions, with variability between strains
- ❖ Sourdough isolates differed from the commercial starter strain in measured EPS parameters
- ❖ Sourdough ecosystems may provide candidate strains for evaluation as starter cultures
- ❖ Further work should examine cultivation conditions and technological relevance of EPS produced by these strains

- Genotype **G5** isolates (A52, A45) showed significantly lower EPS dry mass than other genotypes ($p < 0.05$)
- No significant difference was observed between genotype G5 and genotype **G6** (A51, A44)
- EPS yield ranged from **131.4 to 225.2 mg/L**
- No consistent strain- or genotype-related trends were observed; only minor pairwise differences in EPS yield were detected ($p < 0.05$; e.g., A51 vs. A10, A71, and A37)
- No linear correlation was found between EPS sugar content and dry mass ($R^2 = 0.0177$)