montelukast standard. Overall, BRD4770 successfully increased *P. theae* chemical diversity by epigenetic modification, demonstrating its promise for the synthesis of industrial enzymes, antioxidant applications and the identification of new naturally occurring bioactive chemicals.

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Yamborko G., Strashnova I., Nikolayenko E.

GROWTH DYNAMICS AND EXOPOLYSACCHARIDE PRODUCTION BY COLLECTION STRAINS OF *LACTOBACILLUS CASEI*

Odesa I. I. Mechnikov National University,2 Zmiienka Vsevoloda St., Odesa, 65082, Ukraine
e-mail: jamborkoann@ukr.net

Abstract. *Lactobacillus casei* subsp. *casei* L187 and *L. casei* subsp. *tolerans* L290 are highly efficient exopolysaccharide (EPS) producers in MRS medium supplemented with 5 % sucrose at 24 °C, yielding 107.5 ± 2.3 and 95.6 ± 2.1 mg/mL of biopolymers, respectively. EPS accumulation is a phase-dependent process: synthesis correlates with the logarithmic growth of the culture and reaches its maximum at 24 h of cultivation. Subsequent disruption of this relationship indicates the activation of secondary metabolism or EPS degradation at later growth phases.
Keywords: lactic acid bacteria*, Lactobacillus casei*, exopolysaccharides, growth phases.

Lactic acid bacteria (LAB) play a key role in the development of sustainable biotechnologies due to their ability to synthesize a wide range of bioactive metabolites (Loo et al., 2025). They can positively influence the gut microbiota, stimulate immune responses, and enhance wound healing (Liu et al., 2025). Among LAB metabolites, exopolysaccharides (EPS) hold a special place — high-molecular-weight biopolymers secreted by cells into the extracellular milieu. EPS perform important biological functions: they form the protective matrix of biofilms, increase resistance to stress factors, act as ion-binding agents, and modulate interactions between bacteria and the macroorganism (Kaur et al., 2023). EPS are valuable texturizers, stabilizers, and carriers for drug delivery systems. Industrial production technologies enable standardized EPS production independently of climatic conditions by precisely controlling cultivation parameters.

The aim of this study was to evaluate the growth dynamics and EPS accumulation by *Lactobacillus casei* strains.

The study was conducted using two strains from the Collection of Marine and Biotechnologically Relevant Microbial Strains of Odesa I. I. Mechnikov National University (*Lactobacillus casei subsp. casei* L187 and *L. casei subsp. tolerans* L290), which demonstrated high EPS-synthesizing activity under established optimal conditions based on preliminary screening. *Lactobacilli* were cultivated in MRS broth supplemented with 5 % D-sucrose at 24 °C for 48 h, with sampling every 6 h. Growth dynamics were evaluated by measuring the optical density of the culture suspension (OD_{600}) using a Quant spectrophotometer (BioTek, USA) and by determining viable cell counts (CFU/mL) using the serial dilution and plate count method on MRS agar. An OD_{600} value of approximately 1.0 was considered equivalent to ~$(1–3)\cdot10^9$ CFU/mL (Trabelsi et al., 2013). In parallel, EPS were isolated from cell-free supernatants at each sampling point and quantified using the phenol–sulfuric acid assay (Yadav et al., 2024). Experiments were performed in three independent replicates.

Analysis of the growth curves of the studied lactobacilli strains revealed a positive relationship between the increase in suspension optical density and the number of viable cells up

to a certain cultivation time point. For both strains, the period from 0 to 24 h was characterized by a simultaneous increase in OD_{600} and CFU/mL accompanied by intensive EPS accumulation. Maximum EPS production (107.5 ± 2.3 mg/mL for *L. casei* subsp. *casei* L187 and 95.6 ± 2.1 mg/mL for *L. casei* subsp. *tolerans* L290) coincided with the highest viable cell counts (≈ 9.5 log CFU/mL) at the transition between the exponential and stationary growth phases. This indicates a direct positive relationship between bacterial growth and EPS biosynthesis at the early stages of cultivation. After 24 h of cultivation, OD_{600} remained stable or increased only slightly, whereas viable cell counts gradually declined. At the same time, EPS concentrations no longer increased and even showed a slight decrease, indicating the cessation of active EPS biosynthesis and suggesting partial polymer degradation or reutilization. The indirect relationship between OD_{600} and viable cell counts observed during the stationary phase is typical of lactobacilli and is associated with changes in the physical properties of the culture medium, accumulation of biopolymers, and cell aggregation. The disruption of the positive correlation between growth parameters and EPS accumulation during the later cultivation stages indicates that EPS biosynthesis is not solely dependent on biomass formation but is regulated by the growth phase and the physiological state of the cells (Cui et al, 2023).

In conclusion, the conducted study revealed a clear phase-dependent accumulation of EPS by lactobacilli. During the lag and exponential phases (0–24 h), biomass increase was directly associated with intensive EPS biosynthesis, with the highest accumulation coinciding with the transition point of the cultures into the stationary phase (24 h). During the stationary phase (after 24 h), this relationship was disrupted. In *L. casei* subsp. *casei* L187, a moderate decrease in EPS concentration was observed, suggesting activation of degradative enzymes (glycosidases) or polymer reutilization under carbon-limited conditions. In contrast, *L. casei* subsp. *tolerans* L290 ceased EPS synthesis after 24 h, while the EPS concentration remained stable.

The obtained data indicate that EPS production by the studied lactobacilli is a regulated process controlled by the physiological state of the bacterial population and the growth phase, representing a secondary metabolic product. The determined regularities provide a fundamental basis for optimizing industrial EPS production processes and developing novel functional biotechnological products.

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