Production and characterization of exopolysaccharide from bacillus subtilis 308 and its biological properties

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Abstract

This study investigates the production and characterization of exopolysaccharides (EPS) synthesized by Bacillus subtilis 308 and evaluates their biological properties. The research focuses on optimizing cultivation conditions to increase EPS yield and analyzing their physicochemical characteristics.

The results indicate that microbial EPS have significant potential for use in food, pharmaceutical, agricultural, and environmental applications due to their functional properties, cost-effectiveness, and independence from seasonal factors. This study highlights the importance of microbial exopolysaccharides as promising biopolymers for industrial use.Overall, this work highlights the biotechnological potential of microbial exopolysaccharides and provides a scientific basis for their industrial application.

Keywords

Exopolysaccharides (EPS), Bacillus subtilis 308, microbial polysaccharides, biosynthesis, biopolymers, biological activity, biotechnology, industrial applications, physicochemical properties, optimization

Currently, due to the increasing industrial demand for polysaccharides in various sectors of the national economy, there is a need to discover, study, and utilize exopolysaccharide (EPS)-producing microorganisms. In our country, special attention is being paid to obtaining high-quality, environmentally friendly, import-substituting biopolymer products based on local raw materials and their industrial-scale production. To achieve this goal, the following tasks need to be accomplished: isolating EPS-producing bacteria and evaluating their EPS production potential, extracting and characterizing EPS produced by bacterial strains, optimizing cultivation conditions to increase EPS yield, and developing a biotechnology for EPS production based on bacterial strains. The obtained results can be applied to improve food industry technologies.

Microbial polysaccharides have significant industrial importance. These biopolymers are widely used in the oil industry, in food products (as biofilms, thickening agents, emulsifiers), in medicine (to prolong drug activity, as blood plasma substitutes, and as components of pharmaceuticals), in agriculture (to fertilize soil and increase crop yields), in environmental protection (as biodegradants for cleaning oil-contaminated soils), and in cosmetics (as emulsifiers) [1,2].

The advantage of microbial polysaccharides lies in the fact that their production and quality are not dependent on environmental conditions. Consequently, microbial polysaccharide production is considered more promising and economically beneficial compared to plant-based and synthetic polymer production [3].

Microbial polysaccharides have several advantages over plant polysaccharides. Firstly, microbial exopolysaccharides can be obtained in the required quantities regardless of the season. Secondly, the relatively low cost of nutrient media substrates required for cultivating exopolysaccharide-synthesizing microorganisms makes the production of these biopolymers economically feasible. Thirdly, microbial exopolysaccharides are unique in that they contain monosaccharides not found in polysaccharides of other origins [4].

A review of scientific literature sources reveals that microorganisms from various phylogenetic groups synthesize EPS, and they differ from each other in their physicochemical properties. The wide spectrum of biopolymer producers and the diversity of their properties create a demand for these substances. Therefore, scientists worldwide continue to search for exopolysaccharide-producing microorganisms and study their properties. Microbial exopolysaccharides possess unique physicochemical and biological properties, enabling their application in various fields of human activity.

References:

1. Schmid J., Sieber V., Rehm B. Bacterial exopolysaccharides: biosynthesis pathways
and engineering strategies. Front. Microbiol. 2015. V. 6 (496). P. 1-24.

2. Nadzir M.M., Nurhayati R.W., Idris F.N., Nguyen M.H. Biomedical Applications of
Bacterial Exopolysaccharides. Polymers, 2021. V. 13. 530.

3. Kumar A.S., Mody K., Jha B. Bacterial exoolysaccharides – a perception. Journal
Basic Microbiology. 2007. V. 47. P. 103-117.

4. Nwodo U., Green E., Okoh A. Bacterial exopolysaccharides: functionality and
prospects. International journal of molecular sciences. 2012. V. 13, N 11. P. 14002-14015.