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Microbial production of biopolymers using solid-state fermentation with Bacillus subtilis natto

Marcin Łukaszewicz¹, Marta Domżał-Kędzia¹, Agnieszka Lewińska¹, Marek Weselski¹, Wojciech Wojtowicz² and Piotr Młynarz² ¹University of Wroclaw, Poland

²Wrocław University of Science and Technology, Poland

 \mathbf{B} iopolymers are obtained from a wide range of microorganisms and plants. Microbial polymers are produced by the fermentation process or by chemical polymerisation of monomers. They have a wide variety of applications and can potentially replace synthetic materials. Using industrial by-products to produce exopolysaccharides can reduce the costs associated with their biosynthesis and can solve the problem of waste management after their production. It is important to select an appropriate microorganism that does not endanger human health. Solid-state fermentation (SSF) has biotechnological advantages such as higher fermentation productivity and higher product concentration. Over past five years, there have been significant developments in this method, unfortunately these advances have mainly occurred at the laboratory scale. Bacillus subtilis natto is a well-known GRAS microorganism that produces the biopolymer levan. Levan is a polymer consisting of D-fructofuranose units joined by β -(2,6) linkages and is produced by both plants and bacteria. Microbial levan potentially has a very wide range of applications in the food industry, cosmetics, pharmaceuticals, and medicine. Industrial application of levan depends on its molecular weight, which can be modulated using different strains, as well as culture conditions such as temperature, pH, agitation, carbon source, and other medium components. The aim of this research was to obtain levan in SSF using rapeseed meal as the main substrate and different Bacillus subtilis natto strains. A new bioreactor for SSF was designed. Suitable methods for product separation and purification were also investigated. The purification process was performed with low-pressure liquid chromatography, using different types of column fillers. The molecular weight distribution of levan produced in the SSF process was determined using gel permeation chromatography, and ¹H NMR (Proton nuclear magnetic resonance) was used to identify levan. We observed some differences in the molecular weight range of levan obtained from the cultivation of Bacillus strains in submerged fermentation and SSF. Various molecular weight levans may have different applications due to their specific properties.

Biography

Marcin Łukaszewicz is a Polish biologist, with his research interest and specialization in the fields of molecular biology, biotechnology and microbiology. He did his PhD in Catholic University, Belgium and later became became an assistant professor at the Institute of Genetics and Microbiology, University of Wrocław. He is currently the dean of the Department of Biotransformation, at the Faculty of Biotechnology, University of Wrocław.

marcin.lukaszewicz@uwr.edu.pl

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