Synergistic Co-culture of *Bacillus subtilis* and *Clostridium sporogenes* for Enhanced Biobutanol Production: A Sustainable Approach to Biofuel Synthesis

Anuradha A and Muthu Kumar Sampath*

Department of Bioengineering and Biotechnology, Birla Institute of Technology, Mesra, Ranchi-835215, Jharkhand, India

Abstract

Biobutanol, a promising biofuel with superior properties compared to ethanol, has garnered significant attention as an alternative to traditional fossil fuels. This study investigates the synergistic potential of co-culturing and *Bacillus subtilis Clostridium sporogenes* for enhanced biobutanol production. *Bacillus subtilis*, known for its robust metabolism and extracellular enzyme secretion, is paired with *Clostridium sporogenes*, a proficient butanol producer. The co-culture strategy aims to capitalize on the complementary metabolic capabilities of the two strains, facilitating improved substrate utilization and butanol synthesis. Results demonstrate that the co-culture system exhibits a more efficient utilization of complex substrates, such as lignocellulosic biomass, leading to increased biobutanol production compared to monoculture systems. Monoculture of *Clostridium sporogenes* produced 4.25±0.20 g/L whereas coculture of *Clostridium sporogenes* and *Bacillus subtilis* produced 9.23±0.20 g/L.

This research contributes valuable insights into the potential of co-culturing Bacillus subtilis and Clostridium sporogenes for biobutanol production, offering a sustainable and economically viable alternative for biofuel production. The findings presented in this study provide a foundation for further optimization and scale-up efforts, paving the way for the development of environmentally friendly and economically competitive biobutanol production processes.

Keywords: Renewable Energy, Biofuel, Circular economy, Biobutanol, Coculture