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Bioproduction of Indirubin from Fermentation and Renewable Sugars Through Genomic and Metabolomic Engineering of a Bacterial Strain

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Abstract : Indirubin, a key bioactive component of traditional Chinese medicine, has gained increasing recognition for its potential in modern biomedical applications, particularly in pharmacology and therapeutics. The present work aimed to harness the potential by engineering an Escherichia coli strain capable of high-yield indirubin production. Through meticulous genetic engineering, we optimized the metabolic pathways in E. coli to enhance indirubin synthesis. Further, to explored the optimization of culture media and indirubin yield via batch and fed-batch fermentation techniques. By fine-tuning upstream process (USP) parameters, including nutrient composition, pH, temperature, and aeration, we established conditions that maximized both cell growth and indirubin production. Additionally, significant efforts were dedicated to refining downstream process (DSP) conditions for the extraction, purification, and quantification of indirubin. Utilizing advanced biochemical methods and analytical techniques such as UHPLC, we ensured the production of high purity indirubin. This approach not only improved the economic viability of indirubin bioproduction but also aligned with the principles of green production and sustainability.

Keywords : indirubin, bacterial strain, fermentation,HPLC
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