Industrial biotechnology's application to the chemical industry.

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Abstract

Resources that are biorenewable have a distinctive economic impact. Globally, biorenewables support a wide spectrum of employment prospects, and the biotech sector is experiencing a significant expansion of employment opportunities. Many of these jobs are in rural areas, which help the area's problems with job creation. Industrial biotech is thus not just a rapidly expanding sector but also a source of well-paying jobs in a variety of locations, including rural ones. The field of biotechnology, its applications in the chemical industry, the most recent developments, as well as its sustainability and limitations, are addressed in this article along with an overview and analysis of the topic.

Keywords: Biorenewables, Industrial biotech, Biobased products, Chemical industry, Biotechnology.

Introduction

Biotechnology is the application of living sciences to chemical production. A crucial convergence of forces over the past few decades has aided in the marketization of additional biorenewables. More biobased products are still being sought after by consumers worldwide. This nexus of commercially viable renewable feedstocks and consumer demand represents an enormously exciting opportunity for all parties involved in the biomaterials industry. Over the past two decades, there has been a significant advancement in the technology used to advertise products using industrial biotechnology [1]. Utilizing innovative materials, chemical catalysts with improved performance in biomass processing are being created. These conversion techniques may be advantageous for the environment and the economy. The strength of industrial biotechnology is the broad range of chemical products that may theoretically be produced. However, because hydrocarbon feedstocks were the foundation upon which the chemical industry was founded, commercial commodities are well known and their production technology is advanced. In the direct production of specialised chemicals like citric acid, lactic acid, propane-1,3-diol, and certain amino acids through fermentation, biotechnology is becoming increasingly significant [2]. The biotechnology industry has a long history in the UK. During the First World War in 1916, Clostridium acetobutylicum was fed mashed potatoes and corn, both of which contained starch, to produce a mixture of propanone (acetone), butanol, and ethanol (known as the ABE process). To manufacture the cordite that was used in explosives, propane was required. Prior to ethanol production, ABE was the second-largest industrial fermentation process. On the other hand, the growth of the petrochemical industry in the 1950s provided chemical producers with much cheaper feedstocks, which led to a global decline in the ABE industry. The use of petrochemicals is associated with the release of greenhouse gases that contribute to global warming, making them a finite resource that will cost more as oil gets more expensive. Chemicals produced via biotechnology might reduce our reliance on oil and gas as well as the environmental effects of the chemical industry. Some chemicals, such 2-hydroxypropane-1,2,3-tricarboxylic acid (citric acid), have been consistently manufactured via biotechnology on a million-tonne scale for many years due to the complexity and high cost of conventional synthesis methods [3].

The chemical industry has benefited contemporary civilization by providing affordable goods for our daily requirements. Nevertheless, it is currently dealing with a large issue with pollution and greenhouse gas emissions. As molecular biology, biochemistry, and synthetic biology have matured, industrial biotechnology has improved its efficiency for producing chemicals and minerals. It needs to be improved into "next-generation industrial biotechnology" (NGIB), which is based on low-cost mixed substrates with less freshwater use, energy conservation, and long-term open continuous intelligent processing, overcoming the drawbacks of CIB and turning CIB into competitive processes [4]. Successful NGIB requires contamination-resistant microorganisms, which calls for the utilisation of widely accessible metabolic or synthetic biology engineering techniques and procedures as well as resistance to microbial or phage contamination. It has long been standard practise to evaluate the long-term viability of biofuels and bioproducts using the life cycle analysis (LCA) method. LCAs for bioproducts can be challenging, particularly when the supply chain's feedstock development phase is taken into account. The treatment of co-products in a biorefinery complicates the life cycle assessment (LCA) of bioproducts.

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Water use is becoming more and more important as water scarcity becomes a significant concern. Land use and land-use change are also crucial for the production of biofuels and bioproducts. Given the reliance of results on data sources and technique selections such co-product management, system boundary, and choice of spatial and temporal scale, bioproduct LCAs must be publicly documented to help credibility. Despite substantial technological breakthroughs, sustainable, biobased materials still face challenges in realising their economic potential to boost the circular economy, create jobs, and expand markets for agricultural feedstocks [5].

Conclusion

In the wake of the coronavirus disease of 2019 (COVID-19), customers are reportedly seeking more environmentally friendly solutions as they realise the connection between personal and environmental health. In industrial biotechnology, it can be challenging to identify the most promising chemical products with potential for commercialization. In the absence of governmental policy or consumer demand to reward biobased chemicals, chemical manufacturers embracing industrial biotechnology must produce recognised chemicals at lower costs than petrochemicals or develop novel chemicals that can give distinctive performance for end-use applications.

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